NATURE MAGAZINE
VOLUME 32 · JUNE-JULY · 1939 · NUMBER 6

Years and Years

Study of the life spans of many forms produces some surprising facts

By ALEXANDER SPRUNT, Jr.

Illustrations by R. Bruce Horsfall

MOST OF THE crew of the whaler were ashore on the palm-girt island engaged in the pleasant task of "wooding and watering." During the rest hour one of the sailors strolled up the beach a short distance and stopped to examine a large object that lay near high-water mark. He gave a shout of surprise, which brought the others to him on the run.

Reaching the spot they saw on the sands a large turtle totally indifferent to their excitement. But it was not the creature itself that caused their evident wonderment. On its back appeared *words;* an inscription carved deeply on the shell, and this is what they read: "The Ark, Captain Noah, Ararat for Orders"!

No doubt you smile, shrug your shoulders and reflect that this is a catching piece of fiction; a rather different "sailor's yarn", but why mention it? Because, although that turtle never existed except in someone's imagination, there *are* turtles and other creatures that reach ages that will amaze the majority of people, and cause them to view with increased admiration the lives of Nature's children.

The tale of the turtle from the Ark is only one of many ascribing fabulous life-spans to these creatures. Even scientists have been led astray, while popular belief usually greets all large individuals as veterans. Raymond L. Ditmars, however, in his latest edition of *Reptiles of the World,* speaking of *Testudo vicina,* the largest of the Galapagos species, sums up the matter of age as follows: "These tortoises grow much faster than has been alleged and may attain maturity and great size in less than twenty years. They may live a hundred years or more, but nothing approaching this period is required for their growth to largest size."

The world of Nature holds a multitude of strange and little known facts, not the least of which are the life spans attained by many creatures of fur, feather and scale. They constitute a standing illustration of the old axiom that truth is stranger than fiction. Few people connect old age with birds, animals and reptiles. This is natural enough for we realize that the vast majority of them rarely die of senility; that they meet violent deaths long before old age has a chance to make a record of them. Natural enemies, disease, weather and above all, mankind, see to it that the wild kindred are often cut short in the prime of life, or even before that is attained. However, some animals and birds do live to old age and such an age as is little realized by most of us, whether or not we are inclined to such study.

When an individual of the human race passes the one hundredth birthday it is a piece of "front-page" news in our dailies. Any more than that is considered highly phenomenal. Nature not only equals this but exceeds it.

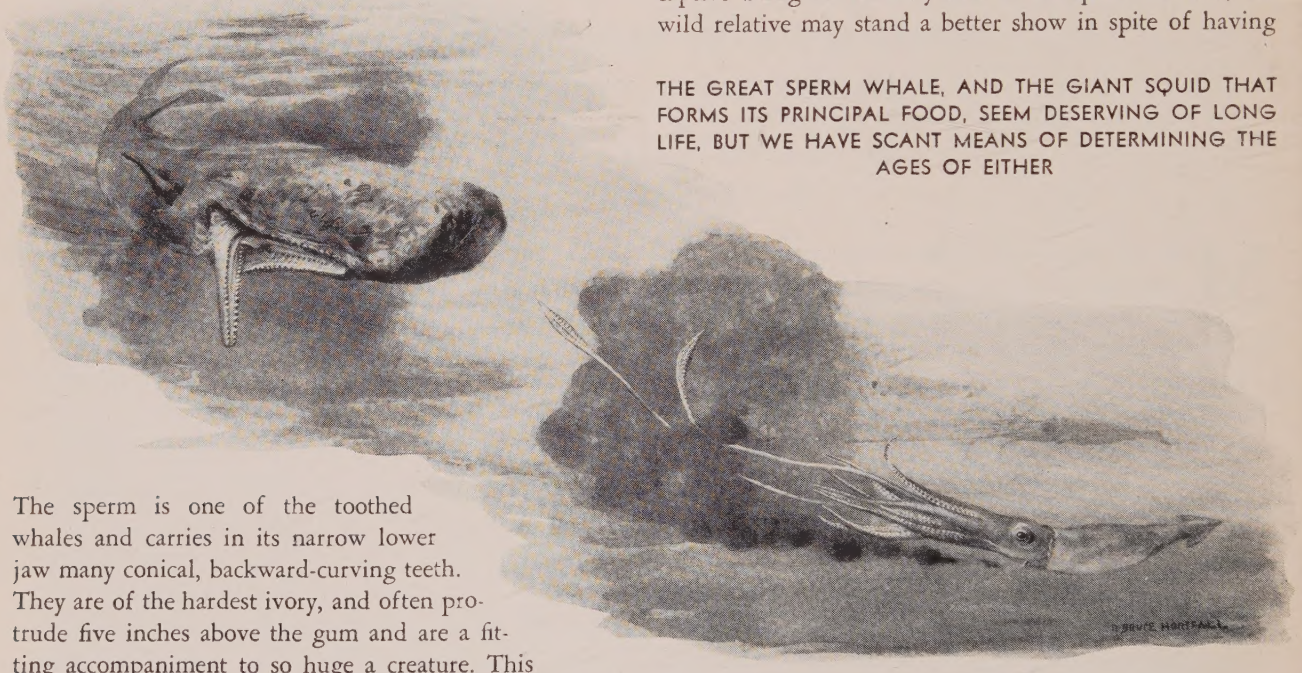
The ocean is ever a seat of mysterious life. Its vast area, and its suspected population of unclassified creatures, combine to render it a huge reservoir of untouched discovery. Progress in knowledge has come recently, and we know much more about it than our fathers did, but even today knowledge is at a premium. The smallest of animate organisms probably frequent the sea and, certainly, the largest do. Of the tremendous range between the smallest and the largest, we know something, but not much.

What of the giant squid? That fearful, pallid monster whose tentacles have a reach of many yards, and whose gnashing, parrot-like beak, and staring black eyes set in a pulpy mass of grayish body, seem to make it more of a nightmare than a living creature. How big do these "devil-fish" grow and how long do they live? No man can answer such questions, and it is due mainly to the activities of another oceanic giant that we know as much about the squid-devil-fish as we do. This monster fulfills

at least one purpose in the eternal economy of sea life—it provides food for a creature even larger than itself, the great sperm whale.

The whale almost invariably disgorges the contents of its stomach when harpooned and lanced, and there are records of very large pieces of cuttlefish tentacle being thrown up. Just how large the creature must have been before furnishing a meal to its huge antagonist, no one can say. Certainly it was, in every sense, BIG. As to how old they become, their life span is shrouded in mystery. They have no enemies except the sperm whale, and the ocean is big, plus the fact that whales are now much rarer then they were. It is not unreasonable to suppose that a squid will live as long as a whale.

As to the age of the latter, we are also much "at sea."



THE GREAT SPERM WHALE, AND THE GIANT SQUID THAT FORMS ITS PRINCIPAL FOOD, SEEM DESERVING OF LONG LIFE, BUT WE HAVE SCANT MEANS OF DETERMINING THE AGES OF EITHER

The sperm is one of the toothed whales and carries in its narrow lower jaw many conical, backward-curving teeth. They are of the hardest ivory, and often protrude five inches above the gum and are a fitting accompaniment to so huge a creature. This whale eats cuttlefish exclusively, and the flesh of the latter is leathery, pulpy and soft, having no bones or other abrasive substance except the beak. Whales have been taken whose teeth were worn down to mere stubs, almost if not quite level with the gum. How long does it take solid ivory to become worn for a length of five inches when employed only against a soft, yielding substance?

Whales fight at times, of course, and necessarily their teeth are sometimes scratched and marked with evidences of having been employed against hard substances, but such occasions cannot be frequent. In this connection, one is reminded of the years it takes for a stalagmite to be formed by the descent of mineralized water upon it, drop by drop.

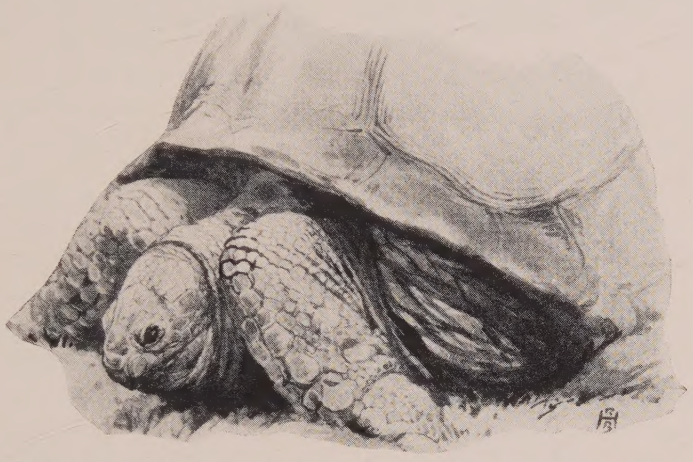
Although nothing definite seems to be known about the life span of the walrus, this huge animal of the northern ice pack must live to a ripe old age. Its tusks, one of its principal characteristics, are something like the teeth of the whale as indicative of the owner's age. Although employed against harder substances than squids, they are very much longer to begin with, and specimens have been brought back from the Arctic with very worn ivory. It is probable that many of these great creatures outlive the Eskimos who hunt them. In that frigid region large wild animals must attain greater age than mere humans.

Because of the obvious difficulties experienced in the study of the life spans of wild creatures, much of what has been learned comes from the observance of captive animals. Such conclusions, however, leave much to be desired, for an animal in captivity, and one in the wild state, are very different things. In some cases the fact of absolute protection from natural enemies results in a creature reaching a greater age than if it had lived in the woods. On the other hand, conditions such as difference in climate, food, and the possibility of disease militate against a specimen attaining a natural life span. The muscular development, general resistance and well-being of a captive being lowered by lack of adequate exercise, his wild relative may stand a better show in spite of having to contend with natural enemies. However, what is learned from zoo animals is much better than pure guesswork.

Since the days of remote antiquity no animal has appealed more to mankind in many ways than the largest of all land mammals, the elephant. Ages ago, humanity imposed its will upon this gigantic creature and made it a servant—the campaigns of Hannibal illustrating the former use of elephants in war. Ever since the ancients were first attracted by them, people have held them in admiration and wonder, and to-day their popularity has not waned. What circus animal receives half the attention that the elephant always commands? A circus without an elephant would be a travesty indeed.

Not the least of the interesting facts in regard to the life history of the elephant is its age. It is one of the few animals that people think of as long-lived, and the belief is well founded. Mr. G. P. Sanderson, whose long experience in India has made him an authority on the wild life of that country, says that the natives believe that the elephant often reaches an age of one hundred and twenty

years. He himself puts eighty years as the average. In his fascinating book on the animals of the jungle, he gives a concrete illustration of an elephant that was owned by the Maharajah of Mysore, captured when a three-year old calf in 1805. Mr. Sanderson knew the animal well during his sojourn in India, and she was, at the time of his arrival, seventy-six years old, and in good working condition, although past her prime. Therefore, having attained the age of seventy-six under somewhat adverse conditions, and still being in good health, it is reasonable to suppose that she lived to be more than eighty. Mr. Sanderson saw female elephants captured in drives that were evidently older than she was, and they were accompanied in several cases by very young calves! The professional elephant drivers believe firmly that the females breed up to the age of eighty.



ONE WOULD NATURALLY THINK THAT AGES WOULD BE NECESSARY TO PRODUCE SUCH A CREATURE, BUT AUTHORITIES ESTIMATE THAT TWENTY YEARS MIGHT BE SUFFICIENT FOR THE GIANT GALAPAGOS TORTOISE TO REACH LARGE SIZE AND MATURITY, BUT THAT AN AGE OF A HUNDRED MAY BE ATTAINED

Mr. Marius Maxwell, an English authority on the African elephant, says that a bull at fifty years of age is at physical perfection. He says that the age of an elephant can be fairly accurately determined by the signs of wear on the ridges of the grinding surfaces of the molar teeth, and the condition of the crowns. In some specimens the ridges have been worn nearly smooth, and as the food is altogether vegetable, such a specimen must be very old, seventy-five years or over. The trunk too, is indicative of age, becoming much shrunken and emaciated in very old animals. The late Carl Akeley, that great admirer of elephants, was firmly convinced that the African animal lives for a hundred years.

Next to the elephant in popular interest among wild animals are the lion and tiger, the kings of the cat tribe. They are frequently mentioned together, and few people seem to realize that they do not occur in the same locality. It is as well for the lion that they do not! The tiger is really the better "man" of the two, and in physical combat the lion is usually the loser. However, the majestic appearance of the former, its place in history, both ancient and modern, has enthroned it firmly in the popular mind as the King of Beasts. As a matter of fact this distinction should be conferred on neither the lion or the tiger, but on the elephant.

To quote Mr. Sanderson again, and his position of official tiger-slayer to the Mysore Government should insure his knowledge of that animal, we read that he places a tiger's age as upwards of twenty years. He himself has killed specimens that were well known to the local natives for that long, all in splendid physical condition, with the teeth in perfect shape, and surely thirty years old. House cats not infrequently attain an age of twenty, and this should be something of a basis for the larger wild species of the family.

What is true of this great cat should reasonably apply to the lion. Having no natural enemies and the probability of disease being rather remote, a lion should reach an age of twenty-five years in many cases.

Among the hoofed animals the age limit is difficult to place. As many of them provide prey for the carnivorous beasts, and are as eagerly sought by human hunters, the percentage that meet a violent death is very large among such species as the deer, antelope, zebra and others. With the heavier and more formidable buffalo and bison, it is another matter. The African buffalo is considered by many big-game hunters to be more dangerous than the lion, elephant and rhinoceros, and as these massive beasts have little to fear from natural foes, their life spans are much greater than their more delicate relatives. The Indian bison, gaur and gayal reach an age of fifty years, it is said.

The ponderous rhinoceros and hippopotamus are two more examples of animals that have little to fear except man. The former is a relic of ancient times, a living reminder of an epoch long extinct, and such a creature, with its armored hide, invulnerability against natural attack, and its limitless food supply, must attain an age far in excess of less massive animals. That it approaches and perhaps equals the elephant in age is probable, and what applies to it would also be true of the hippo. There are areas in Africa now which have been permanently set aside as game refuges, and no shooting will ever be done upon them. The rhino, because of its truculent disposition, sometimes has to be killed to protect human life, but the more placid hippo, living in a sanctuary, must pursue the even tenor of its watery existence for many decades.

If age is not usually thought of in connection with animals, in birds it is even less considered. We think of them as beautiful, vocal, and graceful, but hardly as creatures that have much of a life span. This is natural enough, and for most species, is well founded. Anyone who has kept birds such as canaries, pigeons, or any of the tropical finches know that they are delicately constituted and subject to many ills. However, there are birds which exhibit longevity to a really surprising extent, comparing favorably with mankind.

If asked to name the bird that in their opinion lives longest, most people would probably think of the eagle.

It is a spectacular species; is familiar to many, by name and reputation at least, and has been distinguished by the title of King of Birds, whether rightly or wrongly not being within this present scope. As a matter of fact, there are birds that live longer than eagles, by a good many years, but the latter are among the long livers of the avian world at any rate.

Pairs of bald eagles have been known to nest about a community for more than thirty-five years. The maximum age is hard to determine, but specimens of the golden eagle have lived for forty-six years. It is likely that an age of fifty is sometimes attained, and is, perhaps, near the limit. Eagles, not being protected in many states, and offering the thoughtless gunner a big target, are too often killed. There are those who hold it to be a distinctly harmful bird to the young of domestic and game animals, and while in some cases this is undoubtedly true, there is no reason to condemn all for the depredations of a few. However, many meet death at the hand of man long before they come to old age. The oldest liver among eagles is the short-tailed eagle of Africa, which has been known to reach an age of fifty-five years.

Parrots usually outlive eagles. There are species of this popular and interesting bird which attain an age of nearly seventy years! The average for all species is fifty years, the macaws being more hardy than the others. A life span of sixty-five years is not at all out of the ordinary for them. This is a limit not reached by many of the human race and falls just a little short of the prescribed "three score years and ten" which has so long been accepted as a man's lifetime.

The macaws are closely paralleled, and even exceeded, by the raven and some of the larger owls. The former, so famous in the literature of generations, has been known to live for sixty-nine years, and the great horned owls have come close to this record with sixty-eight. Some of the vultures live fifty years and longer, notably the great griffon vulture, and in view of the fact that these foul-feeding birds certainly have no appeal to man as regards game, it is not surprising that they have a longer life span than many of the more popular birds.

It has long been thought that swans live to a great age, one hundred years and more. There are no grounds for this however, as careful study has resulted in the conviction among scientists that twenty-five years is about the limit of their lives. Some ducks live longer and the geese also exceed the swan in age. The pintail, one of the most beautiful of the duck family, sometimes lives to twenty-seven years and the Canada goose, *the* "wild" goose of this country, has been known to reach the respectable age of thirty-three years, if it is so fortunate as to elude the gun in travel.

TWO MEN AND A CROSS-CUT SAW, IN A FEW MINUTES, CAN LAY LOW A TREE THAT HAS TAKEN A HUNDRED YEARS TO GROW

Naturally, the wild-fowl have a hard time of it. Game birds *par excellence,* they are eagerly sought by millions of hunters annually and few of them live to old age. Banding has revealed some interesting facts in regard to the lives of ducks and geese, and the oldest on record, as far as this practice is concerned, is a pintail that had lived for thirteen years after being banded. That a duck could escape for that long in this day and time is surprising, and since others of the species have been known to live for twenty-seven years, it means that thirteen years is just about half the ordinary life span if the bird were unmolested by hunters.

Some of the larger hawks such as the red-tailed and rough-legged species live to nearly sixteen years. Gulls reach an age of from thirteen to fifteen years, as do some of the herons. Shore-birds like the godwit may live for twelve years.

Unlike the fact that, in the animal kingdom, the largest live longest, in birds this does not hold true. The ostrich, that giant of the avian world, lives sometimes to an age of forty years, and is thus outlived by parrots, ravens, vultures, eagles and owls. It seems significant that, among the longest livers among birds, birds of prey are conspicuous. Little is known about the vast army of smaller songbirds. The sparrows, warblers, flycatchers, wrens and others, are so fragile, meet with so many dangers, and are so difficult to study for long periods of time, that it is all but impossible to place age limits on them. Banding will probably reveal more in the next few years than all the study of the past generation.

While all of the foregoing may be new to many, and the age limits mentioned be surprising, the end is not yet. We have spoken only of animate nature, and as interesting as this is, it is far exceeded by inanimate forms of life, which hold the record for the peak and essence of old age.

The distinction of being not only the largest, but also probably the oldest living thing upon the earth belongs to . . . . a tree! This ancient giant is known to scientists as *Sequoia gigantea* but to the millions who have gazed at it in silent wonder, it is the General Sherman Tree, the proud possession of the United States Government in the sovereign State of California.

Although one cannot but be impressed by its stupendous size, it is the age of the tree which staggers the imagination when faced with the facts concerning it. Big it most certainly is, superlatively big, and though prosaic figures are often flat, they are the only means of imparting some idea to those who have not seen this wonder of the vegetable kingdom. It rises

(Continued on page 355)

MUSK-OXEN FORM A DEFENSIVE PHALANX

Brought to bay by the Eskimo dogs, these strange Arctic animals gather together on defense, the bulls to the fore. Normally not aggressive, they become savage when cornered

Filming Musk-Oxen and Arctic Foxes

By RICHARD FINNIE

IN THE late summer of 1929 the S. S. *Beothic* of the Canadian Government's annual Eastern Arctic Patrol approached Cape Sparbo, Devon Island. From her deck we studied the land through binoculars, hoping for an opportunity to make motion pictures of musk-oxen. We knew that a herd frequented the region, for we had rounded up two of the animals in a fog the previous year, filming them with indifferent success. So the ship had been steered many miles off her course to search for them. Suddenly the sweep of our fieldglasses stopped. Grazing on the tundra near a range of hills were several musk-oxen. We hove to, dropped a boat overside, and hastened ashore laden with still and movie cameras, and accompanied by a couple of Eskimo dogs.

At least a score of musk-oxen were scattered about—old bulls and young bulls, cows and calves—strange Arctic animals whose ancestors roamed as far south as Kentucky and France during the last ice age. As we drew near they began to retreat, but the dogs soon brought them to bay. Thus thwarted, they took their characteristic defense formation, crowding together facing us, the bulls keeping to the fore. The frenzied running and barking of the huskies bothered them, and as the dogs circled the herd the bulls swung around so that no flank was left exposed.

For ten years Mr. Finnie has been making documentary motion pictures of life in the Canadian Arctic. Both independently and as an investigator for the Federal Department of Mines and Resources he has lived in or traveled over much of the million-square-mile Northwest Territories, between the Yukon and Labrador, and as far north as Kane Basin near the tip of Ellesmere Island. He has flown over the North Magnetic Pole; sought traces of the vanished Franklin expedition on King William Island; joined the Copper Eskimos of Coronation Gulf in their hunts and in their drum-dances; camped alone for a fortnight at Bloody Fall awaiting the cataclysmic spring break-up of the Coppermine River, and studied Arctic mammals, from lemmings to walruses.

With the fullest respect for my photographic subjects I advanced cautiously, exposing film at intervals. The bulls snorted and grunted angrily. They would lower their massive heads every few seconds, rubbing them along their shanks, or driving their horns into the turf or against stones as if to whet them. Now and then one of the dogs would venture too close and swiftly a bull would charge out at him for twenty feet or so, then fall back into position with his companions.

Wolves, dogs, and probably a few Eskimos, have been gored and stamped to death or maimed by these shaggy-coated beasts. Although not normally aggressive, they may become desperately savage when molested. Caught up by excitement and the prospect of good close-ups of musk-oxen in their natural state, I forgot warnings. Soon my Eyemo was purring at a bull's head looming large in the viewfinder. I could see the whites of his flashing eyes. One of our party, standing by with a cocked rifle, shouted, "For God's sake get back—if he rushes you now I'll never stop him!"

Musk-oxen not long ago were threatened with extinction because of wholesale slaughter for their skins. Now they are increasing in parts of their range under the protection of the Northwest Territories Administration. They must not be killed by white men, or by Eskimos, unless

to stave off actual starvation. There are a few on the Canadian mainland, northwest of Hudson Bay, and uncounted thousands on several of the Arctic islands—notably Devon, Ellesmere and Melville. Some day they may be domesticated and become economically important for their meat and wool.

My bodyguard's cry suddenly made me think about the safety of my own skin. He was Herr Rose Bjare, intrepid young Danish explorer, who was fated to disappear forever in the polar fastnesses a year or so later. He knew something about the habits of musk-oxen and his words were not to be taken lightly. So I retired a few yards to finish up with some stills. Alternating between two movie cameras, loading and reloading, I had shot more than four hundred feet of film. For a grand climax rifles were fired into the air to stampede the herd. Plunging this way and that in confusion, the musk-oxen clung together for an instant, then, agile even though ponderous-looking (a bull may weigh more than seven hundred pounds), they raced off to the hills.

A GROUP OF ESKIMO COLONISTS

They are being ferried ashore from the R.M.S. *Nascopie* to establish a trading post for the Hudson's Bay Company. All their worldly goods are with them, including a copy of one of the moving picture magazines

Since that summer's day at Cape Sparbo I have reeled off many thousands of feet of motion pictures of native and wild life in the Arctic, but the thrill of that special musk-ox encounter was to be duplicated, not by walruses or polar bears, but by the little white foxes we met in 1937 on Somerset Island, northwest of the Magnetic Pole.

A paradoxical little creature is the white fox. The Eskimos call him *teriganiaq,* and he is, at once, the most valuable and the least valuable of the fauna of the Arctic. In that region neither white man nor Eskimo puts his flimsy skin to much practical use except for parka trimmings and dish-wipers. In North Greenland fox-skin coats, especially among children, have recently become common. As a rule his flesh is not favored as food, although edible, and even the dogs are often reluctant to touch it, unless under stress of starvation.

Yet the little white fox is the very life-blood of Arctic commerce. Were he to become extinct, or were the world of fashion to scorn him, there would be an exodus of fur-traders from the Arctic, and Eskimos might then be obliged to get along without phonographs, radios, accordions, motor boats, and even tea and jam. A half-century ago whalers regularly combed remote polar waters when baleen was worth five dollars a pound. These lusty adventurers trafficked with the Eskimos and gave them work as boatmen and harpooners. Then commercial substitutes for whalebone were put on the market, its price dropped to forty cents and less, and the whaling ships vanished almost overnight. Similarly, the traders may some day go, and the Eskimos, addicted to civilized tastes and customs and thus unable to revert to primitive life, may have to be succored by the Canadian Government until they adapt themselves to new conditions.

But the demand for white foxes has not yet abated. Not so high-priced as silvers or crosses, they can be dyed any hue and are more stable; and the Arctic supply remains an exclusive one because, unlike some of the colored foxes, the whites do not readily breed in captivity. The blue fox is a color phase, sporadically occurring in litters of whites, and, being comparatively rare, commands a higher price. An adult white or blue fox ordinarily weighs seven or eight pounds, varying in size and appearance in different sections of the Arctic. He may sometimes be smaller than the Greenland hares that he kills. Other items of his diet include lemmings in large numbers, ptarmigan, waterfowl and eggs, meat stolen from Eskimos' caches, remnants of polar bears' seal kills, and stranded whale and other sea mammal carcasses.

Some northerners believe that intensive trapping will eventually wipe out the Arctic foxes; others contend that they come and go on the drifting ice floes and that all of them that are ever trapped are just a drop in the bucket. Be that as it may, they increase and decrease in cycles, along with the hares. They are periodically subject to a strange malady, comparable to rabies, which makes them go crazy, and die.

Scores of thousands of white fox pelts are exported from the Canadian Northwest Territories every year. In

THE FOX FEEDS ON A BEARDED SEAL, STRANDED AT HIGH TIDE

Hitherto unmolested by man, the little animals show no fear of the photographer, who is able to bring his camera within six feet of these elusive residents of the Arctic

boom times prime pelts have fetched, at trading posts, as high as fifty dollars apiece. Today they may go for ten or fifteen dollars. When, after passing from hand to hand, they have at long last reached the display windows of metropolitan retail shops as scarfs and wraps, their values have of course risen enormously.

Notwithstanding the fact that nearly everybody has seen white fox pelts, few people—even Arctic explorers—have ever seen live, uncaptured white foxes, unless fleetingly and at great distances. They are ghostly little forms flashing across the snow or tundra for a moment.

It was the first day of September when the Hudson's Bay Company's R. M. S. *Nascopie* steamed down into the uncharted waters of Prince Regent Inlet, the first steel vessel ever to do so. Her crew and passengers were the only white visitors, save a chance whaler, since Admiral Sir Leopold McClintock's party in 1858-59. Herds of harp seals basking on ice floes paid no heed to the *Nascopie*. Even repeated blasts on her whistle failed to disturb them. Anchor was dropped off the eastern end of Bellot Strait, where bearded seals swam inquiringly and without fear toward the vessel; gulls flocked boldly to fight over scraps tossed from the galley. Meanwhile the captain and Hudson's Bay Company officials chugged shoreward in a motor-scow to take soundings and to seek a suitable site for a new trading post. They returned to tell of little white foxes that had run up to sniff at them as they landed.

On this same day, but unknown to anyone on the *Nascopie,* a small schooner called the *Aklavik* nosed into the western end of Bellot Strait, about to become the first craft ever successfully to employ this 20-mile-long channel between Boothia Peninsula and Somerset Island as a northwest passage link. Scheduled to meet the *Nascopie* to deliver fox bales and to receive freight for delivery to western arctic outposts, the *Aklavik* had sailed all the way from Victoria Island. Negotiating the strait, the schooner found overnight anchorage in Port Kennedy, at its eastern opening, where Explorer McClintock had wintered long ago.

FOX FOOTPRINTS IN THE ARCTIC SNOW

The Eskimos call the white fox *Teriganiaq*. His fur, although of present economic importance to them, may yet prove the Eskimos' undoing. Wearers of furs please take notice

On the *Aklavik's* deck were crowded a team of sled dogs that had to be fed. A hapless bearded seal poked his head out of the water near by. A shot rang out, echoing from the surrounding rocky hills that had seen no white men and few Eskimos in nearly eighty years. Mortally wounded, the seal was lost.

Next morning the schooner had her rendezvous with the Eastern Arctic supply ship. Another paragraph was written in the history of the Arctic, with West meeting East at the long-sought key-corridor of the Northwest Passage.

Carrying two motion-

picture cameras, a still camera and a tripod, I trudged several miles overland to Port Kennedy. There, washed high on the beach lay the carcass of the sacrificed seal. It had been discovered a few hours earlier by other *Nascopie* passengers, who had regaled me with incredible accounts of their sitting on its hind end while a white fox fed nonchalantly at its head. Open-minded but expecting nothing, since such wild life performances are seldom given in the presence of a camera, I looked down from a hillside to the beach where the carcass lay.

Tally-ho! There was a fox! He was busily excavating the seal's gullet. He eyed me warily as I approached and then dashed off among the rocks of a nearby cliff. Hopefully, I took up a position about fifty feet away from the seal, mounted one of the cameras on a tripod and lit my pipe, quite prepared for a long and perhaps fruitless vigil. My quarry proved obliging, however. He not only came back but brought a couple of companions. They scampered among the rocks at the base of the cliff, sparred playfully, climbed to the top and silhouetted themselves against a leaden sky.

One of them descended and trotted circuitously toward the seal. Not quite full grown, he was still wearing his summer coat: on top brownish-gray from head to tail, and dirty white beneath. I swivelled my tripodded camera, following him through the viewfinder, while the film shuttled reassuringly. He reached the seal and nervously began eating. I ventured closer. I had no blind, so I simply strove to be as inconspicuous as possible by keeping quiet and making my movements calmly deliberate.

Here on Somerset Island, just above the topmost tip of continental North America, intensive shooting or trapping had never been done. Human intruders had always been so rare that the animals had had virtually no experience with their wiles. This accounted for the tameness of the seals and gulls. And the foxes, being so elusive as to have practically no natural foes, did not yet have reason to be suspicious of man.

I was within twenty-five feet of my fox, yet he continued to tear at the seal carcass as I photographed him. Then fifteen feet—ten—six! It was almost too good to be true. All my motion-picture film used, I swung my still camera into action and, flushed with success, made a dozen exposures, the last of which was at less than three feet. Even at that the fox seemed a good deal less excited than his portraitist. I was tempted to try to stroke him. He would probably have bitten me, but I doubt that he would have run away.

My film supply exhausted, I packed up my photographic equipment, gravely thanked the fox for his co-operation and advised him to beware of other men. He paid no attention, just kept right on eating. By this time it is likely that he has taken his last step—into the jaws of a steel trap—for what he wears for warmth, civilization covets.

•

ANTHURIUMS

By P. M. BARNES

Among the plants noted for the long lasting quality of the individual blooms are the anthuriums. The name comes from the Greek and means tail-flower, referring to the spadix. There are many varieties of these natives of tropical America, where most of them grow on or in the forks of trees. In the United States, they are grown in green-houses.

These plants are highly prized for their peculiar inflorescence and their beautifully-veined and colored leaves. The *Andraeanum roseum* is a favorite. The spathe is a shining rose and thick in texture. It is six to ten inches long. The spadix is creamy white and three to four inches in length. One of these glowing flowers sells for about the same amount as a choice *Cattleya* orchid. With care, the orchid may last a few days. The anthurium will remain glorious for five or six weeks. It can be used in a corsage, and then, if placed in water, can be worn often.

A table at the Shenandoah, Iowa, flower show was decorated with a bowl containing five of these glorious blooms, sent by air express from California. They had to be guarded constantly, for visitors wished to pinch them to see if they were real. Some insisted they were made of wax. After the show, they were taken to the exhibitor's

home. The bowl was placed upon the buffet in the dining-room. Five weeks later they were as fresh and lovely as when first picked. Then they began to fade, but at end of the sixth week, two of the blooms were still colorful.

Black Pearls of the Pond

By MARGARET PINKUS

•

STRANDS OF BLACK "PEARLS" MADE A CHARMING UNDERWATER PICTURE IN THE AQUARIUM, TO BE FOLLOWED BY ENTERTAINING EVENTS

•

WE WERE walking through a woods sparkling with the gleam of sunshine on fresh young leaves. Just ahead sounded the tinkle of a stream. Part of its singing water was held quietly in a small glistening pool, in which were strands of black pearls.

"What are they?" I asked my companion, for he was my outdoor oracle. Those brilliant strands, he said, held myriad little black toad eggs, strung one after the other in long, transparent, gelatinous ribbon. "Take them home," he suggested, "you'll enjoy what follows."

Some none too careful picnicker had left a large tin can nearby, so I carefully gathered the eggs, and some of the greens and pond water. At home, I looped the strands loosely over twigs in a balanced aquarium, making an underwater picture of unusual beauty.

No change was visible to the naked eye for the next eight days. Of course, the cells within the eggs were continually dividing, thousands and thousands being formed within each egg case. Mitosis is science's name for this cell division.

Summer suddenly dropped into spring's calendar. The weather turned almost hot and the sun shone brightly into the aquarium by the window. The next morning I glanced at the eggs. They were strangely misshapen. Something was about to happen, so I pulled up my chair, and, with watch, pencil and pad beside me, I became a fascinated audience at the birth of hundreds of toad tadpoles.

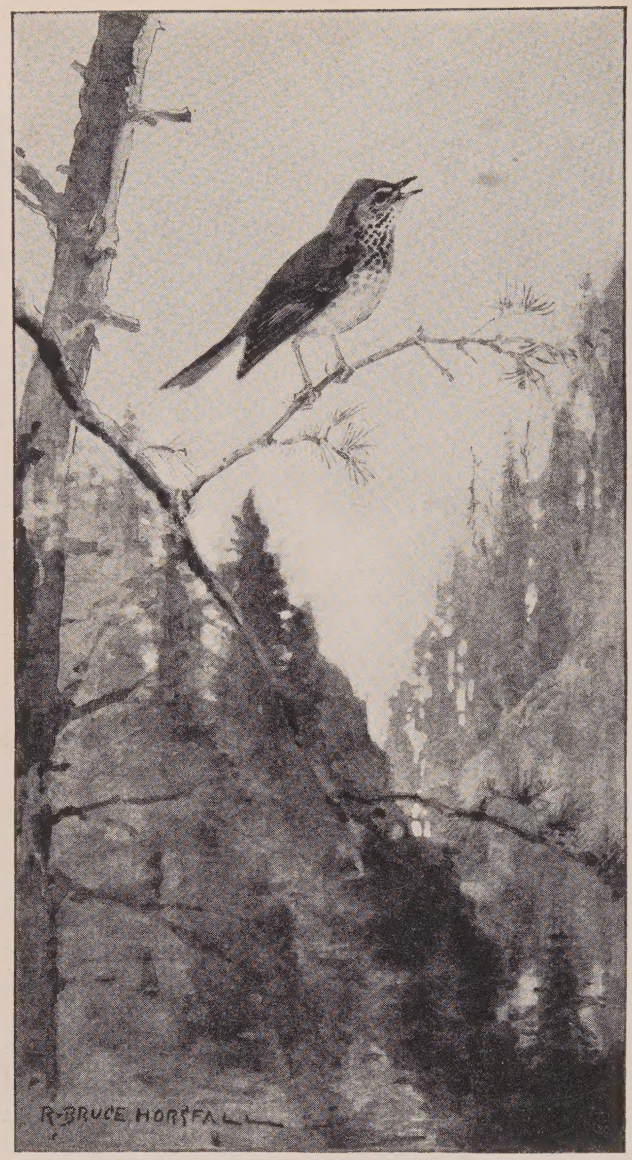
Almost all of the eggs were showing strange liveliness, as though they were little black sacks that held impatient imps. From the first moment when the egg lost its roundness and the writhing movements began, it took from twenty to thirty minutes until the little black creatures broke through the gelatinous strand. From a formless blob, each one immediately took on the shape of a tiny sea horse. Apparently exhausted, they used their suction mouth parts to hold themselves in position just outside their former homes. They then began to wiggle. The strands jerked as the tadpoles quivered spasmodically.

By early afternoon the black pearl necklace was a memory. The strand was almost entirely emptied of its beads. A goodly number of courageous little "sea horses" were making inspection tours of their new home. To call them toad tadpoles at this stage does not give the effect—only "sea horses" can do that. And what amazing antics those wriggling infants attempted! A second or two of well-balanced swimming would suddenly end in a curious tailspin—down, down, until the creature collided with another; bumped against a plant; or whirling, whirling, dropped down to the sandy bottom. Then the daredevils would rest, their sucker mouth parts finding anchorage.

As the days passed and the tadpoles became more active and more akin in appearance to their young frog relatives, they were also less amusing. But their development continued to offer interesting facts for study—the change of the sucker mouth to the true mouth, the opening of the feathery gills, the first outcropping of legs.

Knowing that animals find the taste of adult toads disagreeable, I wondered how my tropical fish would take to toad tadpoles. Dropping a few into the aquarium, I watched the fish as they snatched at them, fought for them, caught them—and spat them out!

These black pearls were a fascinating discovery for me. Keeping them was so simple and the results so interesting that it will be a perennial spring occupation. Just try it.



Singers of the High Places

"FROM THE NEARBY FOREST CAME THE UPWARD SPIRAL SONG OF THE OLIVE-BACKED THRUSH . . . A SONG AS TYPICAL OF THESE MOUNTAIN SLOPES AS ARE THE FIRS AND SPRUCES THAT CLOTHE THEIR RUGGED SIDES"

IT WAS early dawn—a chill, damp dawn of late May high upon the slopes of Mt. Cardigan, New Hampshire. I raised myself upon my bed of browse and looked outward toward the slowly reddening east. The camp, a small open shelter constructed of logs, overlooked a deep ravine and commanded a wide prospect of the distant White Mountains. Of this I saw little, for a sea of mist filled the valley and wreathed upward along the ridges in shifting, filmy streamers that blotted all the farther world from sight.

We had reached the foot of the mountain late the previous evening. By flashlights and the light of a waning moon that "waded" in a thin cloud rack and shone dimly through the western tree-tops, we had climbed the shadowy trail among the birch and maple and upward into the evergreen zone fragrant with the odor of the balsam-fir, heavy and pungent in the cool, moisture-laden air. From the camp we had looked upon a misty landscape, and strained our eyes to catch the faint outlines of the mountains. Above us the stars twinkled brightly. The giant "W" of Cassiopeia hung almost overhead, and, swinging low over the pointed tops of spruce and fir, the planet Jupiter shone lustrously. But wisps of cloud were already creeping along the sky, veiling the silver splendor of the moon and boding ill for the morrow; and now, as I roused myself in the chilly dawn, I saw the fulfillment of our fears in the dim, gray mists that choked the valley and stretched in long, heavy masses along the horizon.

I burrowed closer in my blankets and lay quietly watching and listening to the coming of the day. From the nearby forest came the upward spiral song of the olive-backed thrush. Again and again he sang—a song as typical of these mountain slopes as are the firs and spruces that clothe their rugged sides. Yet how many hikers of the mountain trails have ever observed him carefully, or have caught more than a fleeting glimpse of his sleek, olive-brown back slipping quietly among the trees? He is an unassuming fellow who does not seek to attract our attention, but dressed in camouflaging brown, with buff and white under parts and throat and breast marked with heavy spots of brown, he fits admirably into the general woodland scene and becomes a living, integral part of the evergreen forests from the spruces of the southern mountains to Alaska. With us in New England he is found at elevations of two or three thousand feet, or, where latitude compensates for altitude, in the farther reaches of the northern forests. Here his song peals upward from the cool, moist depths and spirals toward heaven, ringing back and forth along the ravine walls and from the deep green fastnesses.

As with all thrush songs, this wild music cannot be rendered into words. A swirling, upward sweep of sound, loaded with overtones, it possesses an ethereal beauty well befitting the seclusion of the high places. In general character it resembles that of the veery or Wilson's thrush, but the movement of the tones is upward rather than downward, and the sound has not such a strident, metallic ring.

Against the holy notes of the olive-backed thrush I heard the continuous chatter of the winter wren, a more distant sound that seemed to rise from the far depths of the misty ravine. A rollic of rushes and gurgles, of trills and grace notes, that ended only to begin again, bubbling incessantly like the water of the mountain brooks. Hidden

In the quiet of mountain fastnesses the avian choir sounds notes of great beauty

By S. JUDSON EWER

Illustrated by R. Bruce Horsfall

•

"THE BICKNELL'S THRUSH . . . A SOFT, SWIRLING SONG OF DELICATE LOVELINESS . . . THERE WAS A WIRINESS ABOUT THE UPWARD SWIRLS . . . ENDING IN A LONG-DRAWN 'CHEE-REE' "

•

in the brush and scrub, this midget bird goes bobbing about his business of daily living, his dapper brown suit faintly streaked below with markings of a deeper color, and his short tail tilted jauntily above his back. The moist, cold ravines are his home, and from these spots his song bubbles upward—an earthy, watery sound that speaks of the joy of life and living. From the slopes and ridges the song of the thrush leads our thoughts upward toward a realm beyond; from the deep ravines comes the happy trilling of the wren to take us back to earth and the sheer joy of life from day to day. Thus Nature strikes her balances and keeps her listeners at an even keel.

Once or twice I heard the softly-repeated whistle of the white-throated sparrow—a clearly intoned call well known to those who tramp the northland. Many have been the word interpretations given to the notes of this magnificent songster. Some have heard the mundane phrase of "Old Sam Peabody, Peabody, Peabody"; others a wild and plaintive "Sweet Canada, Canada, Canada"; and still others the admonition to a certain Mr. Peverly to "Sow wheat, Peverly, Peverly, Peverly"; but best of all, although probably of no greater accuracy than the others, I like the interpretation given me some years ago by one who lived on the edge of the north country, and whose home looked out upon the rugged hills that rose in ever-increasing grandeur toward the mountains far beyond. To him the white-throat seemed to say: "We are servants of God; we are servants of God". And that, it seems to me, expresses most clearly the rich serenity of the tones as they ring out against the evergreens, the final notes a minor cadence of supplication and pleading.

But even as I lay and listened there came yet another song of the northland—a silvery, metallic tinkle as of tiny bells ringing gently in the wind. No sad tones these or aspiring song of rare unearthly quality, no effervescence of liquid sound, but a softly articulated chiming of some elfin carillon. Here were the musical embellishments that rounded out the beauty of the morning chorus and added the fourth voice to this quartet of mountain songsters. This was the song of the junco, that in winter flits across our whitened fields, and, as the "snowbird", heralds the coming of the

storm. In spring his added numbers spell summer.

The dimness of the mountain dawn brightened into early morning. Through the tops of the firs I caught a momentary glimpse of the sun breaking through the cloud veil and tinting the mist that filled the valley; and then the clouds deepened once again, their gray mantles rolling upward from the ravine and draping downward from the peaks above. Later, as we ascended to the summit of the mountain, an icy mist of cloud wrapped us with its numbing fingers and chilled us to the bone. In vain we tried for even one brief glimpse of the panorama of mountains and valleys that we knew must stretch away on either hand. But we did not need to see that we might know of our location; the singers of the early morning had established our whereabouts among the mountains—they formed an epitome of the northern woods.

There is yet another singer of the high places whose voice I did not hear on Cardigan; a bird of rare occurrence beyond his far northern home and the timber-line reaches of our highest mountains. The Bicknell's thrush, a southern counterpart of the still more northern gray-cheek, ranges from Newfoundland southward to New England

and New York. In the mountains he lives at elevations above three thousand feet where the trees are dwarfed by the scourge of the elements and dwindle into impenetrable scrub. In size and general appearance he compares well with the olive-back, but is paler below and the spots on the breast are of a lighter brown.

My first glimpse of Bicknell's thrush marks a "red letter day" upon my calendar of outdoor experiences. It was the middle of July, and with a friend I was making my first ascent of Stratton Mountain, that thirty-eight hundred foot peak that domes like a great bulky ridge from the rugged hill country of southern Vermont. The day was hot and sultry with thunder-heads piling high in the west and south and drifting hither and yon over the countryside, scattering a pall of haze that dimmed the prospect of a view and threatened a deluge of rain to come. We hiked the mossy forest trail through aisles of spruce and spreading silver birches. Here and there the hand of the lumberman had extended, felled the towering spruce, and had left the logs bereft of their bark lying like gleaming spectres upon the forest floor, there to await transportation to the mill and conversion into pulp and paper to feed the greedy presses of America.

"... THE CONTINUOUS CHATTER OF THE WINTER WREN ... SEEMED TO RISE FROM THE FAR DEPTHS OF THE MISTY RAVINE"

As we ascended, the trilling of the winter wren and the song of the olive-backed thrush seemed always to keep us company. Toward the summit the trail became steeper and more winding, threading its way amid the dwarfed and wind-tossed trees. Suddenly my companion paused and exclaimed excitedly: "There's the Bicknell's thrush!" A soft, swirling song of delicate loveliness came to our ears. It seemed a mixture of the songs of the veery and the olive-back and yet far different from both. There was a wiriness about the upward swirls, accentuated with overtones, and ending in a long-drawn "chee-ree". The best word representation I have seen assigns to it the following syllables: "Sweo-ter-ree, ter-ree".

We peered among the fir branches and tried to get a glimpse of the singer, but he was off with a brown flutter and we thought that we had seen the last of him. And then, behold, as we came out upon the summit we found him once again, not alone but in the company of a group of friends or relatives. They perched upon the topmost twigs of the evergreens, held up their heads and from wide-open beaks sent forth their songs with all the fervor and power their bodies possessed. How well their soft colors of brown and gray fitted into the somber setting of the scraggly trees, and their songs, aspiring to unscaled heights, harmonized with the rugged, wind-swept summit!

In mid-June of the following year I made a trip to the White Mountains of New Hampshire, and climbed the rugged slope of Mt. Adams to The Crag that overlooks the tremendous glacial cirque of King Ravine. Far below the delicate new green of birch clothed the valley floor and stretched irregularly up the walls wherever it was possible to obtain a foothold. Patches of darker green, interspersed here and there, denoted the ever-present spruce and fir, and great boulders piled in tumbled confusion merged with the massive, rocky headwall, fissured with gullies still filled with snow. Far above rose the great granite cones of Madison and Adams, peering down ominously, and at times sending forth masses of gray cloud to swirl and eddy along the ridges and pour sheets of wind-driven rain into the wild, rocky basin. And then, when the clouds had cleared, the mellow afternoon light filled the Ravine, and against the darkness of departing storm a giant rainbow rose upright from the depths and bent its brilliant arch toward the cone of Adams. Here was an austere beauty of the heights, here I was surrounded by the magic of the high places, and here the Bicknell's thrush was singing once again. Upon these mountains he was no transient; here were his nest and young. This was his sanctuary!

At evening I sat upon The Crag and listened. Again and again the song of the Bicknell's rose from the wooded slopes or echoed from the ridges close at hand. I sat enveloped in Nature's evening mantle and listened to her voices. Northward the scattered lights of Randolph Valley came out of the deepening darkness and twinkled gaily. A misty dimness filled the Ravine and crept gradually higher and higher up the rugged walls. All was quiet save for the bird voices and the roar of Cold Brook deep in its rocky gorge. Far above me the sturdy peaks loomed darkly against a pale sky flushed with the afterglow of sunset light. Darkness settled upon the Ravine floor and the purple shadows crawled stealthily toward the summits. Above the rush of the water I could hear faintly the last bubbling of the wren. Nearby a white-throat whistled clear and pure—"We are servants of God", and in the fast gathering twilight the thrushes sang on into the darkness —"Sweo-ter-ree, ter-ree". And then the last singers of the high places ceased, and the curtains of night closed in upon the mountains.

PARENT STARLING CARRYING A MAY BEETLE TO ITS OFFSPRING. THE BIRD'S DIET OF INJURIOUS INSECTS IS LARGE AND OF GREAT VALUE IN CHECKING CROP INJURY BY INSECT HORDES

FROM TWO COLONIES AGGREGATING 120 BIRDS, LIBERATED IN NEW YORK IN 1890 AND 1891, STARLINGS HAVE SPREAD WIDELY. PHOTOGRAPHS FROM THE U. S. BIOLOGICAL SURVEY

How About Citizenship Papers For The Starling?

By RACHEL L. CARSON

WHEN John James Audubon painted his *Birds of America* a century ago, he included no portrait of the starling in that famous portfolio. The omission is easily explained, for starlings did not exist in America in Audubon's time. There is good reason to suppose that every one of the uncounted millions of starlings now inhabiting the United States from the Atlantic Coast to the Great Plains and ranging from southern Ontario to the Gulf of Mexico traces his lineage to two colonies of birds—80 and 40 respectively—imported from Europe and liberated in New York's Central Park in the springs of 1890 and 1891. Several previous attempts to introduce the bird appear to have failed. The successful introduction was made by Eugene Schieffelin, who also brought in the English sparrow and tried without success to introduce song thrushes, chaffinches, bullfinches, skylarks, and nightingales.

In spite of his remarkable success as a pioneer, the starling probably has fewer friends than almost any other creature that wears feathers. That fact, however, seems to be of very little importance to this cheerful bird with glossy plumage and stumpy tail. Without seeming to care whether the benefiting farmer thanks him or reviles him, he hurries with jerky steps about the farms and gardens in the summer time, carrying more than 100 loads of destructive insects per day to his screaming offspring, cramming his own stomach full of such food as Japanese beetles, caterpillars, and cutworms. With complete indifference to angry protests, he finds roosting places in warm cities in the winter, going out each morning, a faithful commuter-in-reverse, to earn his bread in the surrounding countryside.

On one point ornithologists are pretty well agreed—the starling is here to stay. Shall we then continue to regard him as an alien or shall we conclude that his successful pioneering and his service in insect destruction entitle him to American citizenship?

As to economic worth, a pretty complete auditing of the starling's books has already been performed by the Department of Agriculture. After going into the matter of food habits more thoroughly than has been done for almost any other bird, the Department pronounced the starling "one of the most effective bird enemies of terrestrial insect pests in this country."

It was found that the starling is quick to ferret out the presence of the Japanese beetle and to destroy it; that weevils, ground beetles, and plant-eating scarabæids, cutworms, grasshoppers, and millepedes are favorite items of diet. The total evidence led the biologists to conclude that "from the viewpoint of the farmer the insect-eating habits of the starling leave little to be desired. . . . In the northeastern states the starling is economically the superior of the robin, the catbird, the red-winged blackbird, the grackle, the cowbird, or the English sparrow."

The starling is often charged with eating cultivated fruit. On the other hand, it has been estimated that the robin, which no one would seriously propose to "control", eats about twice as much cultivated fruit as the star-

STARLINGS GETTING WARMTH FROM THE LIGHTS OF THE OLD CENTER MARKET SIGN IN WASHINGTON, D. C. THIS MARKET HAS GIVEN WAY TO NEW GOVERNMENT BUILDINGS AND THE BIRDS HAVE MOVED TO NEW ROOSTS

ling. It has been charged that the starling harasses native birds and drives them out of their holes; but it has recently been found that the gentle house wren is also a despoiler of nests, and who does not love the wren?

Even granting his economic desirability, many will continue to condemn the starling for his winter habit of congregating in cities. Objections to the litter produced by the nightly gatherings are responsible for strenuous efforts in many cities to dislodge the uninvited guest. Gunfire has been tried in Harrisburg, Baltimore, and certain other cities under special police regulations. In others, streams of water have been played on the birds; colored balloons have been waved under the roosts; or tin cans have been rattled by the otherwise jobless in an effort to scare away the birds. While temporary success has been attained in some quarters, I have seen no claim that starling roosts as a whole are a whit reduced.

To my mind, the most interesting qualities of this bird are associated with the habit which some find so objectionable. From these nightly encampments, bands of starlings set out for the suburbs shortly before sunrise each morning, are busy all day about their insect-eating activities, and knock off work to return to the city roost at about the same time each evening. Apparently light conditions rather than actual time control the arrivals and departures. Starlings that were watched for a number of successive mornings in October left their roosts 10 to 14 minutes before sunrise on clear mornings, but 5 minutes before on cloudy mornings. In Washington I have noticed that in good weather the starlings are rarely assembling about the buildings and Oriental plane-trees on Pennsylvania Avenue, their favorite roosting places, as early as four o'clock. On dark, threatening afternoons, however, the four o'clock hour is often marked by flocks of starlings hurrying across Lafayette Square or Potomac Park toward their roosts.

One of the most fascinating sights I have ever witnessed is that of starlings in their aerial maneuverings before settling for the night. In mighty flocks, which grow moment by moment through the addition of new arrivals, they wheel and turn above the buildings, patterning the evening sky with intricate designs. Leaderless, apparently animated by the pure joy of flight, their performance is one of indescribable beauty. At its conclusion, the birds settle down rather abruptly on the buildings below. They crowd into church towers; they perch, black as Poe's raven, over windows and doorways; they outline the ledges and the sheltered porticoes of buildings with row upon row of small dark forms. This is a period of intense com-

FESTOONING THE LEDGES OF ONE OF THE GOVERNMENT BUILDINGS. THEY ALSO FIND THE WARMTH OF MOTION PICTURE THEATER LIGHTS WELCOME IN WINTER, SOMETIMES EVEN ROOSTING ON THE LIGHT BULBS THEMSELVES

motion, during which competition for choice roosting places is keen. From now until darkness quiets them, their tongues are never still. A confused, incessant chitter-chatter fills the air, at once sibilant, shrill, and grating; a sound that has become as typical of a city street at dusk as is the raucous hooting of impatient traffic, homeward bound.

Acquaintance with so engaging a bird as the starling suggests many questions, among the most interesting of which is how and when he developed his habit of congregating in cities in the wintertime.

It seems to me that a possible explanation is to be found in the facts of the starling's existence in this country. The birds liberated in Central Park came of a migratory stock. With the coming of cold weather, the starlings of the old world go south: from the British Isles or northern continental Europe to the Mediterranean, the shores of the Indian Ocean, the foothills of the Himalayas. Apparently this racial memory, which the immigrant birds must have carried with them across the Atlantic, was modified by the fact that they were in a strange land—a land crossed by no ancestral air routes that they might follow to a warmer climate.

A TREE OF STARLINGS PHOTOGRAPHED JUST BEFORE SUNRISE AND BEFORE THE BIRDS STARTED THEIR TRIP TO THE SUBURBS TO FEED

If this fear of the unknown was stronger than the instinct to migrate, as we may suppose, it is not surprising that so intelligent a bird as the starling should have sought a substitute for migration. Cities, he quickly found, are warmer than open country. Every observant human knows that the first showing of yellow forsythia and the first up-rushing of pale green shoots come in the city. So the adaptable starlings flock into cities in the fall and winter as the best substitutes they can find for the subtropical climes where their ancestors spent the winter.

Little by little, however, the starlings have extended their range. Little by little they have begun to drift south in winter. For the first six years of their life in the United States breeding starlings were confined to Greater New York. By 1910 they had occupied much of Connecticut, Rhode Island, southern Massachusetts, much of New Jersey, and a little of eastern Pennsylvania. In 1916, an important year in starling history, they crossed the Alleghenies. Thereafter progress was rapid. By 1930 the glossy black bird had become a familiar sight to residents of southern Ontario, Wisconsin, Missouri, Arkansas, and even the northern parts of states bordering the Gulf of Mexico. They have now pushed westward into Minnesota, Iowa, Kansas, and Oklahoma, and a few even farther.

In all this expansion of range there has been evident a pronounced seasonal drift, which is becoming strongly northeast to southwest in direction. Thus birds that breed in western Ontario, western New York, and western Pennsylvania winter in Ohio, western Kentucky, western Tennessee, and even farther to the southwest. The birds commonly live in a new section several years as winter migrants before they move in as breeders.

These facts lead one to speculate on the future of the bird. There is strong evidence that in the relatively short space of half a century the pioneering starling has established the general path of a migratory route. It seems not improbable that in another half century this aerial highway may be known to the bulk of the starling population; that the migratory instinct may become more pronounced as the land to the southward becomes better known. If in time the starling in America forms the habit of wintering on the Gulf coast, as his forefathers wintered on the Mediterranean, will not the need of warm cities be lost and the "starling problem" solve itself? The answer to this speculation depends on many unpredictable factors.

•

BLUE JAY

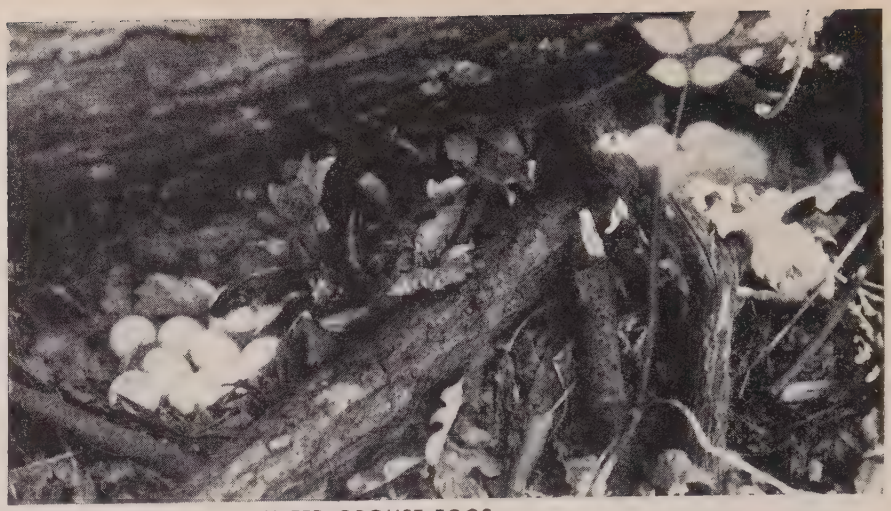
By GENE MOORE

A wag and mimic, you amuse;
In brilliant blue you glibly sport
The coat an elfland king might choose
To garb a jester of his court.

Black Snakes Do Rob Birds' Nests

By

I. H. JOHNSTON



BLACK SNAKE EATING RUFFED GROUSE EGGS

In addition to still pictures, the author secured color and black and white motion pictures of the act

THERE has been a great deal of argument about the black snake's destructiveness to birds and eggs. Some farmers have taken the attitude that the black snake kills so many rats and mice that it is more beneficial than harmful. Many are kept in barns, under the belief that the black snake does not steal hens' eggs or quails' eggs.

One farmer's wife of my acquaintance suddenly changed her mind after she had continually missed eggs. One day while gathering eggs, she chanced to find her old friend the black snake going through some contortions. Looking into the hens' nests, she found that all the eggs, including the china nest egg, were missing. The snake was making frantic efforts to break the china egg, which it had swallowed by mistake. How many different methods it had tried or would still try, she did not wait to see, for she soon despatched her egg thief.

A farmer and his son told me how they watched a black snake break duck eggs in a manner new to me. After the egg was swallowed, the snake would rear itself up as high as possible, then with a whip-like stroke it hit the ground with its body. Fresh duck eggs have a strong shell.

After years of observation of bird life, I am convinced that the black snake is a destructive creature. When you see him crawling around in the shrubbery, he is not there to protect himself from enemies. He is looking for birds' nests. He does not confine himself to low shrubbery, for I have seen him rob a dove's nest twenty-five feet high in a tree. In cases of this kind, he must have seen the nest from the ground before he climbed the tree.

In reference to the accompanying photograph, I will only state the facts as seen and witnessed by others who were with me at the time the picture was taken. On May 12, 1937, I was at Weston, West Virginia, showing motion pictures of wild life that I had taken for the State Conservation Commission. Mr. Clayton, Game Protector located there, asked me if I would like a picture of a ruffed grouse's nest containing fourteen eggs.

The female grouse was on the nest when we reached it. I got up to within eight feet of her. There was a May apple that partially obstructed my view of the bird. While I was wondering what to do about this, the bird flushed. I then set up the 5 x 7 camera to take a picture of the eggs. Just after I had focussed the camera four feet from the nest and put in the plate, I was astonished to see a black snake crawl into the nest and reach for an egg. I picked up my movie camera and began to take the picture of the swallowing of the first egg, barely taking time to snap the 5 x 7 camera. After the first egg was swallowed I changed plates and took a picture of the snake with the bulge caused by the egg showing in its body. I had already finished what film was in my 35-mm camera.

We decided to let the snake swallow a couple of eggs, then kill it and get the eggs out. But the snake had a different idea. He moved as though to leave the nest, but in reality he was only bringing his body into more of a partial coil. With a mighty constrictive movement he broke the egg. Just then the grouse flew near and alighted in a tree, but when she saw we were still at the nest, she flew away again.

The snake now brought his body more completely around the nest, which enabled him to lose less time in swallowing and breaking the eggs. Two more eggs were consumed before Mr. Clayton brought another camera. I took a hundred feet of film within as close as two feet of the snake while he made his meal. He paid not the least attention to the click of the cameras or to our constant conversation.

The third, fourth, fifth and sixth eggs were each rhythmically swallowed in exactly the same length of time. It took but two and one-half minutes from the time the snake started to take the egg, until he had swallowed it and the egg had passed three inches beyond the throat, while the constrictive movement broke the egg and he was ready for the next.

We delayed no longer but killed the snake, straightened up the nest and hurried away. I came back an hour and a half later prepared to take the eggs to the Game Farm and put them in an incubator with pheasants' eggs, providing the grouse failed to return to brood the remaining eight eggs. Stealing quietly up, I saw she was sitting dutifully on the nest. Delighted, I whispered, "I wish you better luck with the rest of your eggs," and left her in peace.

OUR NATIONAL BIRD

A tribute to "Jerry", noble eagle and the pride of the National Zoological Park

By ARTHUR H. FISHER

Jerry is one of the finest bald eagles in captivity in the United States. He dwells in a great cage and is a worthy specimen of our national bird to live in the Nation's capital, and to represent his kind in what is really the zoological park of the entire country.

As he lords it over the other avian occupants of his cage, Jerry is blissfully unaware that there has been, and still is, debate about the propriety of the bald eagle as the national emblem. Even one hundred and fifty years ago Benjamin Franklin launched a philosophic protest against the American eagle being chosen for place on the Great Seal of the United States. The good Dr. Franklin campaigned for the wild turkey and accused our "noble bird of prey" of cowardice, laziness and a thieving nature. Others have protested that a predatory bird is scarcely a proper symbol. To our shame Alaska still puts a price on its head. There is no need to add fuel to the fire of argument. By popular acceptance and

official recognition—through seals and coins and stamps —this strong-winged flier is a symbol of the liberty of our American democracy.

The charge that the bald eagle, *Haliaeetus leucocephalus,* is a coward is debatable. True it is that eagles will not always defend their eggs and young against human invasion, while some of our tiny song birds will risk freedom and their lives in such cause. It may be that the eagle has learned the deadliness of the gun, and subscribes to the bird version of the adage that "discretion is the better part of valor". Be that as it may, Jerry, at least, is no coward. And were his home some craggy aerie and his nest held eggs or young, I would go well armed on any invasion of his province. But then Jerry is an exceptional eagle, let it be remembered.

As for indolence and thievery, one must confess doubts after watching the industrious osprey, homeward bound with a hard-earned fish, being held up in mid-air by one of these white-headed hi-jackers. Furthermore, when the osprey is forced to drop his fish, if the eagle misses it in air he fails to make any effort to go either to earth or to water to redeem it. As much as I admire Jerry, I admit that I would not trust him in such matters. But, after all, he is only an eagle and a predator, and we have seen worse things happen in Wall Street.

Benjamin Franklin also overlooked a strong moral point in his protest. Our American eagle is neither bigamist, polygamist, nor philanderer. It mates for life and consistently remains at its own hearth until one of the pair meets a natural or violent death.

My first acquaintance with Jerry was when he arrived at the Washington Zoo more than fifteen years ago. He was about two years old then, and had not yet acquired the white head and tail feathers that give the bald eagle such a distinguished appearance in contrast to other raptores of comparable size. These adornments are acquired in three years, but Jerry did not wait until he attained this mark of maturity to make his personality stand forth. He came from Alaska, where eagles are eagles, and he proceeded to prove that he, at least, was no coward, by sending the older members of the Eagle Club to the high perches. There they have remained ever since, except when he sees fit to have it otherwise.

Jerry then turned his attention to his keepers, and before he had fully established the fact that he was no timid soul he had sent two unwary custodians to the hospital.

In the new flight cage of our National

Zoo Jerry is still the outstanding exhibit. While nearly all of the other dozen or more good specimens of the species remain aloft, he occupies his special perch on the ground floor, screaming his defiance to all, visitors, keepers, and cage-mates alike.

As a photographic subject this eagle stands alone. He fearlessly maintains his position within a few feet of the camera, and during years of effort I think I can safely say that I have recorded Jerry in every pose characteristic of his kind. Bald eagles have been supposed to have lived for one hundred years. It is my hope that this one, with his ten pounds of weight and seven feet of spread, will carry on for the entertainment of two more generations. Benjamin Franklin notwithstanding, the American eagle became our national bird and emblem, and Jerry is the epitome of every design that has appeared on our flags or emblems.

Francis H. Herrick, who holds high rank as a student of the life history of American birds, has put on record the intimate story of a pair of bald eagles that is a masterpiece, and, we believe, is based on the most careful study ever made of the nesting of any species of eagle. This account was published in a series of four articles printed in *The Auk* during 1924, and to these articles we are indebted for the following brief summary.

Professor Herrick's studies were made in the summers of 1922 and 1923. The nest selected as the main subject was placed in the leaning top of a shellbark hickory in Vermilion, Ohio. The margin of this nest was eighty-one feet above the ground.

In order to obtain a vantage point from which to

entire nesting seasons of 1922 and 1923, this site was occupied by Professor Herrick or his assistant nearly continuously during daylight hours from early March to midsummer, when the young left the nest. These elaborate preparations, and the unswerving persistence and attention to detail that characterized the entire investigation, resulted in a wealth of material that enabled the author to make a contribution that will long stand as a model for such work.

observe the details of life in the nest, the observer built a strong cabin-like retreat in a great elm. As completed, this structure commanded a view of the surrounding country and the nest from a point about one hundred feet above the ground, and nineteen feet above the nest level, which was about ninety feet from the blind.

The nest studied was one of four that had been situated within a distance of two miles, and had served successive pairs of birds, probably blood relations, over a period of nearly ninety years, as attested by the observation of old residents. The earliest nest, two miles east of the one studied, was occupied from about 1835 to 1863, and two others followed. Abandonment of these early sites was necessary because the nest trees were felled, twice by Nature and once by man.

This lofty blind was reached by a steel ladder that originated at a point on the tree-trunk seventeen feet above the ground, and was reached by a wooden ladder. During the

PHOTOGRAPH BY HILEMAN

Some Common Food and Game Fishes

The fifth in Nature Magazine's series of educational inserts

By E. LAURENCE PALMER

WHEN Rupert Brooke wanted to write about Heaven he took the point of view of a fish and said,

"And in that Heaven of all their wish
There shall be no more land, say fish."

Most humans would conceive any ideal environment as having a stream, or other body of water, as an important part of it. Yet some of us probably know as little of what goes on in our waterways as the fish know about what takes place on dry land.

Ignorance of the problems of waterways, and unwillingness to use what knowledge we have, has led to widespread pollution of streams with consequent loss of valuable economic and recreational resources, not to mention creation of menaces to health. Nature Magazine has continuously, effectively and justly presented the ethical and economic aspects of pollution. This insert supplements the pollution information by presenting the stories of the lives and habits of the important fishes of our fresh waters. It also supplements the story of certain common aquatic insects, which appeared as the first of these inserts in October, 1938.

Since fishes are animals they perform the usual life functions of breathing, eating, reproducing and growing. Living in water, their breathing problems are somewhat different from those of animals that live surrounded by air. They must get their oxygen from the water. To do this, they are continuously drawing a current of water in through their mouths and letting it pass out over the gills, which are usually protected under flaps at either side of the back of the head. The gills are generally something like fringes of flesh, well supplied with blood. They are hung to a series of arches—or gill arches—so that the best use may be made of the water that passes through. When the water is not sufficiently supplied with air, the fish suffer or die, just as we would if we could not get air. When water is loaded with organic waste, so much of the oxygen in the water is used to dispose of the waste that there is not enough to support the fish. They therefore die. The plants and animals on which fishes feed also will die under these conditions. Pollution and fishes cannot ordinarily get along well together.

It is true that pollution by certain organic wastes, such as those from milk factories, may, if handled wisely, be used to supply foods for organisms that eventually may be eaten by creatures having food value for fishes. This, however, can be worked out only by careful management, and this has not as yet become general practice. The pollution of streams by inorganic wastes from smelters, gas plants and a variety of industrial factories cannot so be turned to profitable channels.

Try a few experiments with a goldfish to see how it behaves under different conditions. Reduce the amount of water available to the fish and see if the rate of breathing is increased or decreased. Raise the temperature of the water and watch what the fish does when the amount of air in the water is reduced by this method. Reduce the amount of surface of the water open to the air, either by applying a close cover to the jar or by putting a film of oil on top of the water. What the fish does under these circumstances, if reasonably interpreted, should teach more than anything that could be written here.

Try similar experiments, using fishes of two kinds at the same time to see whether they behave alike. It will be found that each kind of fish cannot survive a certain critical temperature of water. Because this temperature is lower with brook trout than it is with brown and rainbow trout, and lower with small-mouthed bass than with large-mouthed bass, the brook trout and small-mouthed bass are found in colder bodies of water and generally have a more northerly distribution than their near relatives just mentioned. Stream management requires, first of all, assurance that the temperature of the stream will not at *any* time of the year rise above the point that is fatal to the species to be raised in it. This temperature can be kept down by providing shade for the headwaters of the stream, and certain stretches of water below must be kept deep and cool by shade and springs.

Fishes appeared in the seas of the earth in Ordovician times and held a dominant place into the Devonian. Their migrations, food relations, enemies and abundance have, since they first appeared, influenced the prosperity of other living things. Their home life involves indifference, jealous antagonisms, satisfaction of selfish desires and probably true parental care and solicitude. Monogamy, polygamy, polyandry and promiscuity are to be found represented in the domestic relationships of fishes. They are intelligent or dumb, sluggish or playful, cautious or pugnacious, indifferent or aggressive and, in terms of man's interests, useful or harmful. Such an array of varying qualities makes them worthy of study by all.

The distribution of North American fishes, as known at present, is largely conformable to the drainage systems as determined by the last ice age; conditions previous to that time, of course, had laid their own foundations. With the melting of the great ice barrier, the fishes that had been displaced were able to move northward again, often to occupy new territory. The present limits of many species are determined by barriers that were laid down during the period of readjustment. At the same period there were left, in many places, especially in mountain passes, ponds whose levels are still so nicely adjusted to the terrain that from them small streams issue that eventually find their way to oceans on opposite sides of the continent. Each of such streams, of course, unless its upper course is interrupted by impassable falls, contributes species to the other.

Perhaps the best known and most widely publicized of such cases in the United States is Two Ocean Pass, in northwestern Wyoming. In a level mountain meadow mix at times the waters of Atlantic and Pacific creeks, so-called from the final destination of their waters—the first in the Gulf of Mexico, via the Yellowstone, Missouri and Mississippi, and the other in the Pacific, via the Snake and the Columbia. David Starr Jordan considered it probable that this pass may have been one of the avenues that permitted trout of primitive times to pass from Pacific to Atlantic waters on the long journey that these tribes made from their original home in Asia—where he thinks it probable that the group originated—to eastern America, a trip that took ages, and was largely accomplished by short moves along the coasts from stream to stream.

In recent years, other similar mountain passes farther north in the Rocky Mountain system have been discovered, and these afford means of passage by interior waters of fishes of certain groups between Atlantic, Pacific and Arctic waters. The Arctic grayling, *Thymallus signifer,* is rather consistently confined to the Mackenzie drainage of central Canada. Preble, in 1908, pointed out that the occasional occurrence of the grayling in the Hudson Bay drainage might be explained by the fact that Black Lake, east of Athabaska Lake, outlets both to the Mackenzie and the Churchill, and that this route would seemingly account for the species reaching Hudson Bay, since a fish so well fitted for the negotiation of swift streams could hardly neglect so plain a route. The grayling is also taken in the Stikine, a river rising in the interior of British Columbia, and entering the Pacific through the panhandle of Alaska. Since this species is not known to enter salt water, its probable migration from the Mackenzie to the

Stikine by direct passage through some pass was suspected. The discovery by Preble of a small unnamed lake in a pass in the Rockies in central British Columbia, with small issuing streams that reach tributaries of the Peace and the Stikine, seemingly affords a feasible route. Farther north a similar water route exists between the Mackenzie and the Yukon by way of the Porcupine, and it is altogether probable that other similar pathways exist between the 56th parallel and the Arctic Circle. Perhaps, instead of Two Ocean Pass, some of these more northerly passes helped our trout species in their long migration in early times.

Another distribution factor, this time a barrier, seems worthy of mention. Access to long reaches of streams and lakes is denied in many places by the occurrence of falls that fishes cannot surmount. Diamond Lake in Oregon, a few miles north of Crater Lake (also naturally fishless) is of this class. Diamond Lake, with no fishes, was originally monopolized by the crayfish, which had almost no enemies. Trout have lately been introduced and have thrived wonderfully. In some cases such lakes, denied fish life by impassable cataracts, may be stocked by the eggs of fishes accidentally transferred in the mud adhering to the feet of birds. Many such cases have been discovered.

•

ACKNOWLEDGMENT

As has been the case with other numbers of this series, this material is a modification of and an improvement on similar material that has appeared in numbers of the *Cornell Rural School Leaflet* published by the New York State College of Agriculture, and prepared by the author. This material is used with the consent of the college. The illustrations in this article are from the pen of Hope Sawyer, and are copyrighted.

The writer has personally collected specimens of each species here considered except the sturgeon, these collections being made from coast to coast. He has witnessed the breeding habits of half of the species mentioned and has supplemented his own observations with those of others. The most useful references for those interested in following these studies more intensively include the following:

Gage, Simon Henry, *The Lampreys of New York State.* Life history and economics. Annual Report of New York State Conservation Department. 1927.

Hawes, Harry B., *My Friend, The Black Bass,* Frederick Stokes. 1930.

Innes, William T., *The Complete Aquarium Book,* Halcyon House. 1936.

James, M. C., *Propagation of Pondfishes.* Document 1056, U. S. Bureau of Fisheries. 1929.

Jordan, David Starr, *A Manual of Vertebrate Animals of the Northern United States.* A. C. McClurg. 1899.

Moore, Clifford B., *The Book of Wild Pets,* G. P. Putnam's Sons. 1937.

Morgan, Ann Haven, *Fieldbook of Ponds and Streams,* G. P. Putnam's Sons. 1930.

Needham, Paul R., *Trout Streams,* Comstock Publishing Company. 1938.

Roule, Louis, *Fishes and Their Ways of Life,* W. W. Norton and Co. 1935.

Stewart, Norman Hamilton, *Development, Growth and Food Habits of the Common White Sucker.* Document 1007, U. S. Bureau of Fisheries. 1926.

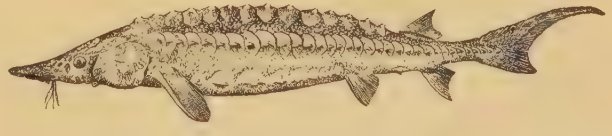
•

THIRTY FISHES AND THEIR LIFE HISTORIES

LAMPREY. (1) SEA L. *Petromyzon marinus.* (2) LAKE L. *P. m. unicolor.* (3) BROOK L. *Lampetra* sp. Class Cyclostomata. Order Hyperoartia. Family Petromyzonidae. 15 species in Order. (1) and (2) have circular mouths lined with teeth; (3) teeth in groups. Length, (1) 3 feet, (2) 18 inches, (3) 8 inches.

Eggs laid April to June, in nest built by male, or both sexes. Larvae, "mud lampreys" in stream bottom 4 to 5 years; transform July to March; (1) and (2) go downstream to live 1½ to 3 years as fish parasites; (3) not parasitic, free swimming less than 1 month. All breed but once, always in streams.

Fresh-water streams, all stages of (3), larvae and breeding adults of (1) and (2); lakes, immature of (2); and the sea, immature of (1). Larvae, good fish food; 45,000 used annually in New England for cod. Destroy many food fishes. Some eaten by man. Eggs of (1) to 235,950; of (2), 108,270; of (3), 3276.



(1) SEA STURGEON. (2) LAKE STURGEON. (3) SHORT-NOSED STURGEON. (1) *Acipenser sturio;* (2) *A. rubicundus;* (3) *A. brevirostrum.* Class Pisces. Order Chondrostei. Family Acipenseridae. Length, (1) to 12 feet; (2) to 6 feet; (3) to 3 feet. Weight, (1) to 550 pounds; (3) to 50 pounds. Back, with huge bony plates. Snout, variable.

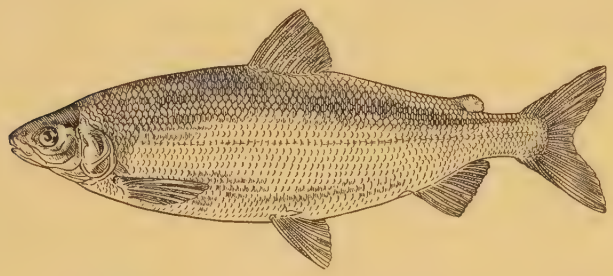
Marine forms and others run up streams to mate and lay eggs which soon become sticky. (1) 1 to 2½ million; (2) and (3) 20% of weight of fish. (2) may lay eggs on rocky ledges. Eggs, about 1/9 inch in diameter. Adults in Russia believed to have lived as long as 300 years.

Great Lakes produced 3,500 tons in 1880, 50 tons in 1917; lost through unwise management, and "caviar" obtained from other fishes. One Lake Erie firm harvested 18,000 fish in one year. Flesh good, and eggs, when made into caviar by being salted, have high market value (to $100 per fish). Swim bladder supplies material for making superior glues, court plasters and isinglass. Different species extend range through Old and New Worlds.

(1) COMMON GARPIKE. (2) ALLIGATOR GAR. (1) *Lepisosteus osseus.* (2) *L. tristoechus.* Order Holostei. Family Lepisosteidae. Length, (1) to 5 feet; (2) to 10 feet. Weight, (2) to over 100 pounds. Covered with large bony scales. Jaws, armed with sharp teeth.

Feeds largely on other fishes captured by sudden dashes. Can breathe without use of gills by using air in swim bladder much as a lung is used. Often seen at surface taking in supply of air. Eggs strewn among plants.

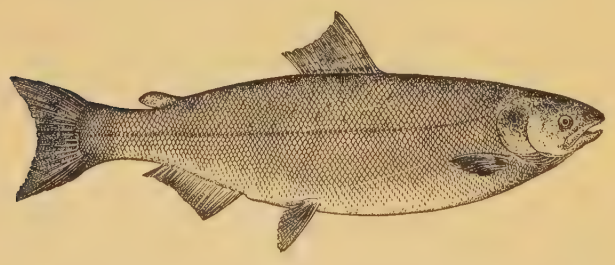
(1) Great Lakes to Rio Grande and along Atlantic coast even in sea. (2) Southern states north to the Ohio River. Great pests as destroyers of more valuable fishes. Bony covering so hard it has been used to cover war shields by primitive peoples, and to cover plows. (2) Large ones may be dangerous to any animal.



WHITEFISH. *Coregonus clupeaformis.* Order Isospondyli. Family Salmonidae. Unlike the salmons and trouts the mouth is small and the upper jaw extends only to the eye. Length, 5 months, 2-3; 1 year, 8-9; 2 years, 12-15 inches; max. 2 feet. Weight, to 23 pounds. Color, olive, with white sides.

Mates in November and lays eggs in shallow water over rocks, up to 75,000 in number but normally about 10,000 per pound. Eggs, 1/8 inch in diameter. Many are reared artificially in hatcheries to try to maintain a supply. Incubation, 5 months. Mature in 5 years. Food, like that of trouts, animals.

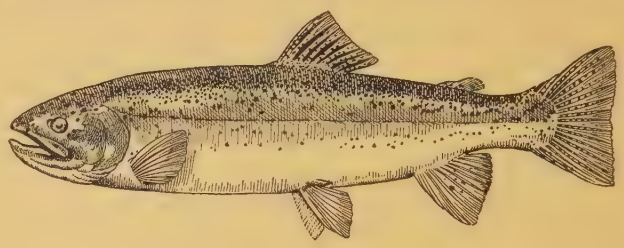
Most valuable food fish of the Great Lakes and the supply is diminishing through unwise harvest methods. Most of year in deep water. May make spring feeding migration to shallows. Found in the Great Lakes and north to the Arctic Circle. Captured in gill nets, now being set in very deep water.



PACIFIC SALMON. (1) KING; (2) SILVER; (3) RED OR SOCKEYE; (4) PINK. (1) *Oncorhynchus tschawytscha;* (2) *O. kisutch;* (3) *O. nerka;* (4) *O. gorbuscha.* Family Salmonidae. Max. weight, (1) 100 lbs.; (2) 10; (3) 7; (4) 6. Anal fin rays, (1) 15-17; (2) 13-15; (3) 14; (4) 14-16. Black spots in (1) larger than in (2).

Swim upstream, (1) July-Oct.; (2) Sept.-Nov. at age of (1) 3-8 years; (2) 2-7; (3) 4-8; (4) 2; for long distance (1) and (3). Female builds nest, mates, spawns, dies. After (1) few weeks; (2) 1-2 years; (3) number of months to 3 years, young returns to sea, length (1) 1½ inches; (2) 5 inches. Parr marks, or dark areas on sides, in (1) broad; (3) round; (4) absent.

Eggs, used as bait; hatch at 50° F. in 50 days. Most valuable food fish, in Columbia River alone worth $10,000,000 annually, employs 25,000 people, industry threatened by Federal dams. 1935 total, $32,475,266. From California to Alaska. Finest sport fish.



(1) RAINBOW TROUT. STEELHEAD. *Salmo gairdnerii.* (2) ATLANTIC SALMON. *Salmo salar.* Family Salmonidae. Anal rays, 9 or 10. Length, 5 months, 2-3; 1 year, 4-6; 2 years, 8-9 inches. Weight, (1) to 42 pounds; (2) to 103 pounds. Many relatively small, black spots on lighter background. Steelheads, silvery sea-run fish, become darker.

Migrates to spawn February to June. Female builds nest in riffle over gravel. Eggs, 200 to 9,000, fertilized and abandoned. Incubation, 22 days at 57° F. 5-inch fish known to grow 1 inch a month at 63° F. Breeding male (1) shows conspicuous rose bands on sides. Breeds more than one year in both (1) and (2).

(1) Can survive stream temperature of 83° F. Prefers streams connected to sea or large lake. (1) Native of Pacific coast but widely established over world; superior game fish. (2) Formerly an important food fish from Delaware north along Atlantic coast to Spain; now practically gone in America; some resident in lakes.

BROWN TROUT. LOCH LEVEN TROUT. *Salmo trutta.* Family Salmonidae. Length, 5 months, 2-3; 1 year, 4-6; 2 years, 8-9 inches. Weight, to 40 pounds. Yellow-brown with (usually) large, dark spots on lighter background on sides and (usually) few red spots. Lower fins, white or pale yellow. Scales, larger than those of brook trout.

Spawns in fall, running upstream to shallower water and breeding much as does brook trout. Incubation, about 31 days at 57° F. and fertilization about 99 percent. Nest abandoned and young left to shift for selves. Fish may breed year after year. Nest may be in water 4 feet deep, but usually shallower.

Can survive water temperature of 81° F. but naturally prefers cooler water. Favors more quiet water than brook trout. Introduced from Europe and widely established. Will drive out native brook trout in warmer waters. Crossed with true Loch Leven trout, which were introduced in 1884.

CUT-THROAT. BLACK-SPOTTED TROUT. *Salmo clarkii.* Family Salmonidae. Weight, to 20 pounds. Anal rays, 10. Commonly heavily spotted with black. Sides, without red spots; characteristic but often inconspicuous red on under side of jaws on either side. Scales, relatively coarse and easily rubbed off as with rainbow and brown trouts.

Breeding male shows rose band on sides resembling rainbows. Spawns in spring in nest built by female. May be crossed with

rainbows in nature or in hatcheries but such eggs are not virile. Some ascend from sea for short distance. Lake forms go up adjacent swift streams, general procedure resembling the rainbow.

Excellent sport and panfish of the west, some being found as far east as Montana and the Yellowstone and present in most of Pacific coast streams. May destroy great numbers of eggs of salmon and rainbow trout, although this may also be said of the rainbow trout itself.

BROOK TROUT. *Salvelinus fontinalis.* Family Salmonidae. Length, 5 months, 2-3; 1 year, 4-6; 2 years, 8-9 inches. Weight, to 17 pounds. Back, with worm-like markings. Body, red-spotted. Lower fins, edged with black and orange. Color varies with nature of bottom. Flesh, firm and of superior food value. Very gamy.

Starts upstream about October, males first. Female makes nest in riffle over gravel, and mates. 3-year fish lays 100 to 300 eggs; older, up to 5000, about 80 percent fertile. Hatch in 44 days at 50° F.; in 90 days, at 40° F. Male may guard nest 3 weeks. Eggs stick to gravel. May spawn at 6 inches, second year.

Best in hard- or soft-water streams with maximum temperature of 66° F. but can survive 75° F. Labrador Peninsula to Georgia, west to Montana and Saskatchewan, sea-run in Labrador. Introduced over world. Now freed from hatchery when of legal capture size. Easily reared in hatcheries and most popular of stream fishes.

LAKE TROUT. MACKINAW TROUT. *Cristivomer namaycush.* Family Salmonidae. Length, 5 months, 2-3 inches; 1 year, 6-7 inches. Weight, to 80 pounds. No red spots but large white spots on darker background show on sides and back. Fins, gray and similar to general color. *"Cristivomer"* refers to raised and toothed vomer bone in roof of mouth.

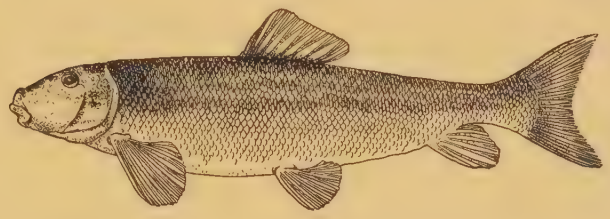
Mates over nests or hard bottoms, in water 3 to 20 feet deep, a 24-pound fish producing about 15,000 eggs. Young not cared for by parents. Eggs are suitable for rearing in hatcheries though fish themselves do not normally live in types of water commonly found in trout hatcheries.

Found in large cool lakes from New England to Montana, British America, Alaska, the Great Lakes region being a valuable source of commercial fishing. Supply decreasing rather dangerously because of excessive catches due to modern techniques of fishing.

COMMON EEL. *Anguilla bostoniensis.* Order Apodes. Family Anguillidae. One American species. Males, up to 3 feet long; females, up to 5 feet. All slender, with small head but sharp teeth and large mouth. Scales, minute, imbedded and hidden.

American eel breeds but once, laying up to 10,000,000 eggs deep in sea between Bermuda and West Indies. Young, transparent, flat, to 3-inch *Leptocephali* for a year; 2d spring, ascends streams, going as high as 8000-foot elevation in Colorado. May burrow in mud in winter. Spends 6 to 8 years inland, then returns to sea to breed and die.

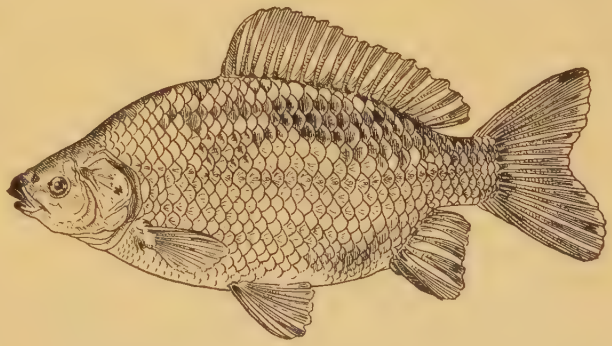
In fresh and brackish water, in all parts of world except Pacific coast of North America and Pacific islands. Males, rare in fresh water. European eels breed near West Indies. Valuable food fishes unfortunately caught just before breeding time though reproductive organs do not mature until after return to sea. Feeds mostly at night. Annual U. S. catch worth about $250,000.



WHITE SUCKER. COMMON SUCKER. *Catostomus commersonii.* Order Eventognathi. Family Catostomidae. About 70 species in 15 genera. Length, 5 months, 1½-2; 1 year, 2-3; 2 years, 5-7; max. 18 inches. Mouth, with sucking lips, on lower side of head. Scales, small. Flesh, bony, and soft.

Runs upstream in early spring to breed in shallow nests built of gravel in swift water. Eggs fertilized as deposited. Young unprotected; swim near surface and feed about 10 days. Matures at 6 inches. Adult returns to deeper waters after breeding to wait and develop for another breeding season. Food of fish over 3 inches long, small animals.

Found in fresh waters over mud bottoms except in breeding season from Labrador to Montana and south to Georgia and Missouri, with 67 related American species and 2 eastern Asiatic species. An inferior but popular food fish. May destroy the eggs of more valuable species.



GOLDFISH. *Carassius auratus.* Order Eventognathi. Family Cyprinidae. The European goldfish *Carassius carassius* has not produced many types. Well known as aquarium fish usually white or red with relatively large scales and often appearing with unusual eyes, fins and colors. Some black and some brown.

Mates early morning to afternoon, April to May, laying 10 to 20 amber eggs at a time to total over 500, which stick to submerged or floating plants. Hatch at 70°F. in 3 to 7 days. Good breeder has 2-inch body, matures second year, breeds until 9 and may live until 15. Food, that of a general scavenger.

Originated in the Orient and widely distributed over world in water containing lime and between 70° and 55°F. for best development. Has a good sale value for aquarium and pond use and where reared commercially is fed by putting mixture of ⅔ sheep manure and ⅓ superphosphate fertilizer on bottom of pond.

CARP. *Cyprinus carpio.* Family Cyprinidae. Coarse-scaled, soft-fleshed fish, blackish above and golden yellow on sides and belly, with 4 barbels on mouth. Length, 5 months, 3-5; 1 year, 6-8; 2 years, 12-15 inches. American maximum weight, 42 pounds. A fish caught in Switzerland in 1825 weighed 90 pounds.

In central New York, breeds in May and June, a 16-pound fish laying as many as 2,000,000 eggs, which hatch in 5 to 12 days depending on temperature. Maturity reached in 2 or 3 years. Breeds and feeds in shallow water. Does not protect young. Food, plant and animal matter strained from mud, fish eggs.

May supplant superior fish by destroying eggs, nests and young. Some 250 tons harvested annually in New York as cheap food and to protect more valuable species. Carp found in fresh waters in Europe and eastern Asia. Too well established in America. Generally considered as fish pests here.

GOLDEN SHINER. ROACH. *Notemigonus crysoleucas.* Family Cyprinidae. Length, 5 months, 1; 1 year, 1½-2; 2 years, 2½-3; max. 12 inches. Golden green in upper parts with sides silvery and fins yellow. Lateral line more or less parallels the bottom line of the body. Mouth, small.

Unique in food habits since from 90 to 95 percent of food is plant material and only a small amount is composed of invertebrate animals. Because of this, the animals are not competitors for food with the usual game fish and they are themselves superior food for the more valuable species.

Common in ponds and slow streams where there is an abundance of vegetation, from Nova Scotia to the Dakotas and south to Texas and Tennessee. One of the best bait minnows, being hardy and living long on the hook and being abundant within its range. Not of direct food value to man.

COMMON SHINER. REDFIN. DACE. *Notropis cornutus.* Family Cyprinidae. Length, to 8 inches. Scales, large. Back, dark steel-blue. Sides and belly, silvery. About 100 species closely related. In the spring, belly of male is pink and head roughened.

Male builds nest in shallow, swift water, and eggs are laid here by a number of females when the temperature is about 73°F. Male protects nest and eggs. Food, about 85 percent plants and 15 percent small animals. Grows relatively rapidly where food is abundant and enemies few.

Common in small streams through entire region east of the Rockies to north of Texas and the Neuse River. Related species extend the range particularly to the south. Acceptable and attractive aquarium fish and hardy bait minnow which does not compete for food with more valuable game species.

BLACK-NOSED DACE. *Rhinichthys atratulus.* Family Cyprinidae. Length, to 3 inches. Slender, active, varying considerably through range with the males rosy on fins in spring. Conspicuous, black, lateral band. Body, slender. American species, 3; Mexican, 1.

Mates in spring and early summer, sometimes two males to one female usually in swift water over gravel. Male may have whole body a crimson color at height of breeding season. Food, largely small animals (example, 70 percent midge larvae, 17 percent Mayfly larvae). Also eats fish eggs.

Common in clear brooks and streams where water is swift from New England to Minnesota and south to Alabama, with related species and genera extending range into Rockies, west and south. Good aquarium fish but not to be desired in fish hatcheries. Food for and competitors of other species.

HORNED DACE. COMMON CHUB. *Semotilus atromaculatus.* Family Cyprinidae. Length, 5 months, 1-1½; 1 year, 1½-2; 2 years, 3-4; max. 10 inches. Scales, crowded and smaller in front of dorsal fin which has a dark spot at base and is placed above middle of body. Steel-blue above; sides and belly, silvery.

In breeding season, heads of males are orange and horn-covered. Male builds nest in May to July in swift water using small stones pushed in to make a circular pit. Females enter and lay eggs, which are fertilized and guarded by male. More than one female may lay in a nest of a male. Some breeding in migration.

Common in fresh-water streams from Maine to Wyoming and south to Alabama. The ideal fish for the small boy since it bites readily at almost anything and fights well for freedom. Is edible but inferior to other fish of the same waters. May eat the eggs of superior species.

BULLHEAD, HORNED POUT, CATFISH. *Ameiurus nebulosus.* Nematognathi. Family Siluridae. 900 species in the family, 30 in the United States. Length, 5 months, 2-2½; 1 year, 3-4; 2 years, 5-7; max. 20 inches. Mouth, large. Scales, lacking. Single, coarse spines in dorsal and forward side fins. Barbels, conspicuous. Dark to silvery.

Food, from bottom, of variety of materials, may be tasted along under side of body. Mates in late spring and lays about 2,000 ⅛-inch eggs in nest built and guarded by male. Incubation, about 5 days. Young, which are coal black, may stay in school protected

by father through first summer.

Common in quiet, warm, mud-bottomed waters from Maine to Dakota and south to Texas and Florida. Introduced in California. Close relatives extend range. Superior pan and small boy fish and excellent food for man. A related catfish caught in the Mississippi in 1878 weighed 150 pounds—a record.

MUSKALLUNGE. MUSKY. *Esox masquinongy.* Order Haplomi. Family Esocidae. Length, to nearly 9 feet. Weight, to 100 pounds (?). Real authentic record of 75 pounds from Wisconsin. Lower half of cheeks and of gill covers not covered with scales. Rays of dorsal fin, 17 to 19.

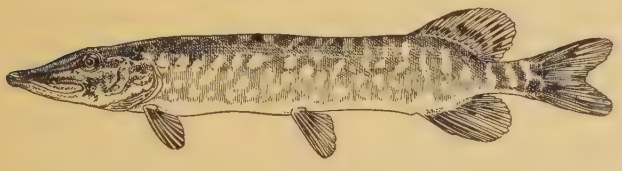
Mates in May and June in shallower water among the brush and weeds, a 35-pound fish being able to lay up to 265,000 eggs, each about 1/11 inch in diameter and not likely to stick to others of its kind. Young not cared for by parents. Food, entirely other fish and animals.

Found in lakes from the Great Lakes region, occasionally into the Ohio valley or even as far south as North Carolina. Considered one of the best of game fishes because of its superior fighting ability coupled with great size and general food properties. Naturally destroys other fishes.

BROOK PICKEREL. *Esox americanus.* Family Esocidae. Length, 5 months, 4-5; 1 year, 6-7; 2 years, 8-10; max. about 14 inches. Cheeks and gill covers, *entirely* covered with scales. Mouth, large, terminal and well armed with sharp teeth. Scales, small and for the most part uniform.

Mates in early spring in shallow, weedy water, producing several thousand eggs fertilized as two parents swim side by side. Eggs hatch in 2 weeks. Eggs do not adhere to each other. Young not protected by parents or placed in a nest. Food, any animal that can be captured.

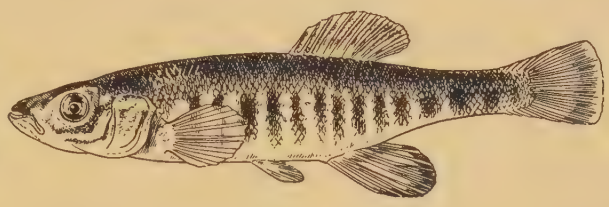
Common in ponds and slow streams among vegetation from Maine to Florida and west (as *E. vermiculatus*) in the Great Lakes and Mississippi basins. An excellent game fish intolerant of competition with other species and easily reared in hatcheries though cannot be crowded because of cannibalism.



PIKE, JACK FISH. *Esox lucius.* Family Esocidae. Cheeks, entirely scaly; gill covers, not scaly on lower half. Length, 5 months, 5-7; 1 year, 8-12; 2 years, 14-17 inches; max. over 4 feet. Weight, to over 40 pounds. Blue or greenish-gray, the scales appearing small. Dorsal fin, with 16 or 17 rays while the pickerels have 14 or less.

Breeds in spring, in shallower waters of lakes and streams. Parents swim side by side dropping 100,000 or more 1/3-inch eggs, which do not stick together, among the weeds. Eggs hatch in 2 to 3 weeks without parental protection. Food, almost entirely other fishes captured by sudden dashes.

A superior game fish with excellent food qualities, easily reared in hatcheries during earlier stages. Found from Alaska eastward through Canada and south to New York and Ohio; also in northern Europe and Asia. Introduced and established elsewhere where conditions are suitable. Generally very popular.



TOP-MINNOW. KILLIFISH. *Fundulus* sp. Order Haplomi. Family Poiciliidae. Some 180 species in 30 related genera. Length, to 4 inches. Lower jaw projects up and beyond upper. In related genus *Gambusia,* anal fin of male is sword-shaped; in *Fundulus,* it is normal.

Males, more brilliant than females. In *Fundulus,* eggs fertilized outside the female and deposited in vegetation. In *Gambusia,* eggs fertilized and partly developed in female. Food, almost entirely small forms of life caught near the water surface. Destroys immature mosquitoes.

Found near surface of fresh and brackish waters of Europe, Africa and America, one common species, *F. heteroclitus,* ranging from Maine to Mexico. Makes satisfactory aquarium fish and is used with varying success in large mosquito control projects. Not useful of course in temporary ponds.

(1) CRAPPIE. *Pomoxis annularis.* (2) CALICO BASS, *P. sparoides.* Order Acanthopteri. Family Centrarchidae. Length, to 1 foot. Anal fins nearly as long as dorsal. Dorsal spines of (1) 5 or 6; of (2) 7 or 8. (2) is deeper, generally darker and heavier than (1).

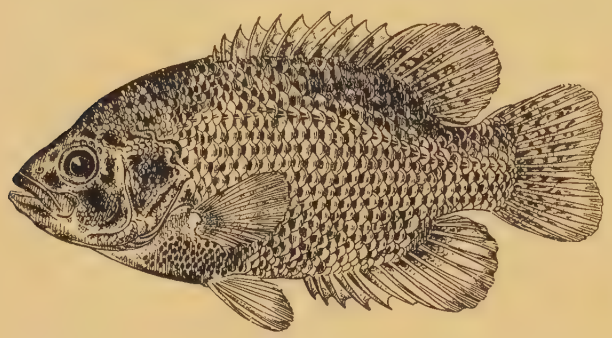
Spawn in early summer in rather deep water over gravel in separated nests not easily observable. Incubation a few days to 2 weeks or more and likely to be injured below 58°F. or destroyed below 55°F.

Both are popular ready-biting panfish (1) being sometimes called "strawberry bass". Feeds chiefly on aquatic insects and kin. Found mostly in pools and slow streams from Texas to Alabama and north to Vermont and the Dakotas.

COMMON SUNFISH, BREAM, PUMPKIN SEED. *Eupomotis gibbosus.* Family Centrarchidae. Length, 5 months, 2-2½; 1 year, 3-4; 2 years, 5-6; max. 8 inches. Spines on anal fin, 3 as with warmouth but no teeth on the tongue in the sunfishes. Body, deep. Color, brilliant from green to olive with orange belly and spots on sides.

Male builds a nest on the bottom commonly among weeds. Bottom of nest hollowed out and about 1 foot across; may be rootlets or gravel. Eggs and young are protected vigorously by the male. Food is any small animals which may be captured such as insects, other fish, worms and crayfish.

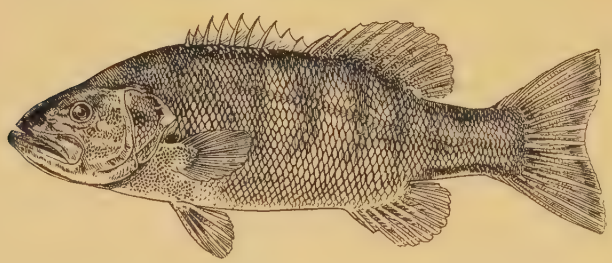
An ideal fish for the small boy and an excellent panfish. Common in ponds and streams where there are mud and vegetation from Maine to Minnesota and south through Florida through the Mississippi Valley though more uncommon in the south. Were it larger it would be an outstanding game fish.



ROCK BASS. *Ambloplites rupestris.* Family Centrarchidae. Length, 5 months, 1-1½; 1 year, 1½-2½; 2 years; 3-4 inches; max., 1 foot. Anal spines, 5 to 8; dorsal, 11. Gill rakers, less than 10. Contrast with Sacramento Perch *Archoplites* with 20 gill rakers, 12 to 13 dorsal spines; and warmouth, *Chaenobryttus,* with 3 anal and 10 dorsal spines.

Breeds in early summer in water of about 74°F. temperature, placing eggs in nests prepared and defended by male. Food, other fish, crayfish, worms and insects which it is able to capture. Bites vigorously. Fights valiantly for life when hooked. If larger, would be great game fish.

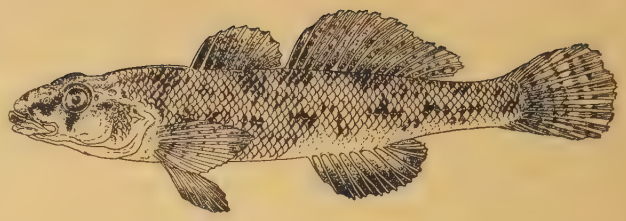
Excellent panfish, generally popular and abundant, in lakes and slow rivers from Vermont to Manitoba, south to Alabama, Louisiana and Texas, being most common west of the Alleghenies. Related Sacramento perch is found in the Sacramento and San Joaquin Rivers. In south, is the related warmouth.



SMALL-MOUTHED BLACK BASS. *Micropterus dolomieu.* Family Centrarchidae. Length, 5 months, 2-3; 1 year, 4-5; 2 years, 6-8 inches; max. 2 feet. Back margin of lower jaw in front of center of eye rather than behind it, as in the large-mouthed black bass or "trout" of the South. Tail, with dark band. General color, uniform, dull green.

Male builds nest, cares for young and eggs from May through July. About 7,000 eggs per pound of weight of the female. Eggs, stick together unless cared for and young die unless protected. Food, minnows, crayfish, hellgrammites and other aquatic animals. Probably the best game fish of its environment.

Commonest in clear, cool lakes and streams from Lake Champlain to Manitoba and south to South Carolina and Arkansas. Widely established by planting outside normal range, particularly in New England. Requires water cooler than 100°F., which large-mouthed survives. Not raised easily in hatchery trays.



JOHNNY DARTER. *Boleosoma nigrum olmstedi.* Order Acanthopteri. Family Percidae. Length, rarely over 3 inches. Scales, fins and head, relatively large. Color, olive with numerous black blotches particularly on the sides. Body, tapers only slightly to rear.

In spring, male is commonly darker in forward parts. Most darters attach their eggs to under sides of stones or pebbles in a nest-like excavation, which is built usually in swift water. Food is essentially small animal life though some are destroyers of the eggs of other fishes.

Common on bottoms of small, cool streams, among weeds and stones and unable to get to surface except with effort. This species found in territory east of Colorado and Manitoba but close relatives extend range. May make interesting aquarium fish if the temperature can be kept down sufficiently.

PIKE-PERCH, WALL-EYED PIKE, DORÉ. *Stizostedion vitreum.* Family Percidae. Length, 5 months, 5-7; 1 year, 8-12; 2 years, 12-15 inches; max. 3 feet. Weight, to 25 pounds. Cheeks and gill covers sparsely scaled as distinguished from sauger or sand-pike, *S. canadense* (Smith) in which they are fully scaled. Color, dark olive green with darker blotches; pinkish belly.

Mates in April and May. 2-pound fish produces 45,000 1/5 inch eggs per pound. Incubation, 2 weeks. No parental protection. Lends itself to hatchery conditions, many fish being stripped when they are taken in nets by market fishermen. Millions are distributed yearly from hatcheries.

Found in lakes and large rivers from Hudson Bay and upper Mackenzie south through Vermont, Pennsylvania and Georgia and west to Alberta, being more abundant in its northern range but particularly important in Great Lakes region. Known in the west and south erroneously as "jack salmon."

YELLOW PERCH. *Perca flavescens.* Family Percidae. Length, 5 months, 2-2½; 1 year, 3-4; 2 years, 5-6 inches; max. to about 1 foot. Weight, to 3 pounds. Color, yellowish, with dark green bands. Scales, moderate. Skin, tough. Flesh, excellent. Body cavity, relatively small.

Mates early summer, pairs swimming through weeds laying, fertilizing and abandoning among weeds ⅛-inch eggs in zig-zag ribbons sometimes 7 feet long. 24-ounce fish may produce 41 ounces of eggs. Food, small animals such as worms, minnows and crayfish.

A superior and popular food and game fish caught on hook and line or in nets and sold in markets. Found in lakes and streams, preferably where there is a mud bottom and little current, from Nova Scotia to Dakota and south to Ohio, with related species in Europe and in Asia.

The Golden Eagle

Photographs by Wright M. Pierce and William L. Finley

The other common eagle of North America is the golden eagle, *Aquila chrysaetos*, which ranges in this continent from northern Alaska and Canada south to North Carolina and Mexico, but confines itself mainly to mountainous sections. In the Old World it is found from northern Eurasia south to northern Africa, the Himalayas, and Japan. It has long been considered as the king of birds, and, when falconry was in its heyday, could be flown only by monarchs.

The nests of the golden eagle are usually built on cliffs, but under certain conditions the birds choose trees. Nests in trees have been found as low as ten feet from the ground, and as high as ninety in the air. Sometimes, when the nest is on a cliff, the young bird may leave the nest several days before taking wing.

The golden eagle seems to prefer mammals for food, but birds are also taken, especially when the young eagles are small. Nearly all the larger mammals and birds in the vicinity of the bird's home must pay tribute to this swift and powerful predator.

The fact that game birds and the young of domestic animals form a part of their food has led to persecution of eagles, for man is prone to overlook the fact that great numbers of prairie dogs, rabbits, marmots and ground squirrels are eaten by the birds, and that probably the harm done is compensated by their good offices in this respect.

The period of incubation is about five weeks. The young generally leave the nest when nine or ten weeks old.

EAGLES OF OTHER LANDS

Photographs by Kleman

Eagles, after all, are merely large hawks, and every country with a reasonable quota of wild birds and mammals has at least one species, for it seems to be Nature's intention to provide for as wide a variety of life as the vegetative resources of a region will maintain. Here are presented a few eagles, or eagle-like birds, from foreign lands.

His black majesty, the wedge-tailed eagle of Australia, *Uroaetus audax*, is one of the largest of all eagles. So strong a bird may easily be harmful and lambs are occasionally taken. Some flock-owners, however, consider that the harm done is more than balanced by its great destruction of rabbits. There are two proved instances of the great birds swooping at children, but without doing any harm. Altogether, Antipodean bird-lovers are proud of their great eagle, found only in Australia.

The crowned hawk-eagle, *Stephanoaetus coronatus*, dignified despite its hated captivity, makes one wish that all bars could be lifted, and all captives might go free. The barred breast seems to be obliterative in its function, probably serving to hide its owner from the view of its jungle prey. This bird ranges widely in Africa from Liberia to Uganda.

Bonelli's hawk-eagle, *Hieraaetes fasciatus*, ranges from southern Europe and northern Africa east to India and South China. Superficially resembling the goshawk, it is even swifter than that bird and is considered the most agile of the birds usually classed as eagles. It preys on hares and other small mammals, and on various large birds, being particularly adept at capturing pigeons, and even takes trained falcons. The nests are usually placed on cliffs (one, the Rock of Gibraltar), but may at times be built in trees.

As its name, *Haliaeetus vocifer,* indicates, the African sea eagle is related to our own white-headed bird, and, like other so-called sea eagles, is wise in extending its habitat to the forested interior, although still insisting on areas that are well watered. Although smaller than the northern species, it is among the handsomest of the group. Both its tail and head are white, and the same color extends to its upper back, and to the breast. The abdomen and the inner wing coverts are deep chestnut, while the wings are black. It is widely distributed over Africa.

Steller's sea eagle, *Haliaeetus pelagicus,* considered to be the largest existing species, is confined to the mainland and islands of northeastern Asia.

The harrier eagle, *Circaetus gallicus,* sometimes called the short-toed eagle, ranges from the region about the Mediterranean to India. As the picture shows, it has very short toes for a bird of prey. The wings are long and the bird spends a large part of its time in the air. Sometimes it occupies a lookout on a lofty tree, or hovers in one spot until it discovers a snake or lizard, reptiles being its favorite prey, and then suddenly drops upon it. The bird occasionally occurs in southern France, where its eggs have been found in mid-May.

HARPY EAGLE

Photograph by Fisher

The harpy eagles are confined to tropical and temperate America, from northern Patagonia to southern Mexico. There are several forms; the one here figured, *Thrysaetos harpyia*, came from the Amazon Valley. These large raptores, although classed as apart from the true eagles because of certain structural features, are truly kingly birds. The Aztecs call their species the winged wolf; the Spaniards named theirs the king eagle, terms that well attest its prowess. The boldness of the present species is illustrated by an instance observed in Brazil where a bird entered the open window of an occupied cabin and seized and carried away the house cat in the presence of the family.

The chosen habitat of the harpy is the forest, and its food consists chiefly of mammals, even those of two or three times its own weight. Monkeys, sloths, foxes, the young of deer and peccaries, as well as turkeys and other large birds, are thus forced to contribute to its support. The forest creatures subject to its attacks are well aware of the danger, and must be continually on their guard.

The nest is built either on a tree or a rocky cliff according to the conveniences at hand in the birds' chosen territory.

★ Conservation ★

A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

★

LEGISLATING ★ ★ THE WILDERNESS

There is pending before Congress a bill—H. R. 3648—designed to further the establishment of wilderness areas within the boundaries of National Parks and Monuments. The bill provides "that, in order to preserve perpetually for the benefit and inspiration of the people of the United States the primitive conditions existing within national parks and national monuments, the President may, by proclamation, when he determines that it is to the public interest and upon the recommendation of the Secretary of the Interior, set apart certain tracts of land within national parks and monuments as wilderness areas. No hotels, permanent camps, highways, roads, truck trails, or other similar physical improvements shall be constructed within such wilderness areas. Nothing in this Act shall be construed as prohibiting the erection of foot and horse trails, simple trailside shelters and such facilities incidental thereto as may be necessary for pedestrians and horseback riders."

We are in the heartiest accord with anything that will assure the preservation of wilderness areas. We have hoped that strict adherence to the early standards for National Parks on the part of the Park Service itself would make unnecessary such legislation. But if, as it now admits, the Park Service does not feel that those early standards are sufficiently definite and positive to resist the demands of political pressure and local commercial influence, then the matter should be cleared up by Act of Congress once and for all.

The trouble with H. R. 3648 is that it still does not go far enough. We suggest that it should be so amended as to provide specifically that in our so-called National Primeval Parks (Yellowstone, Glacier, Sequoia, Yosemite, Great Smokies) all areas not already "developed" by roads, permanent camps, truck trails and such, be declared as wilderness areas within the meaning of the Act and thus be immediately protected from the "development virus" which has beset the Park Service. It would then require no less than a further Act of Congress, with attendant publicity and opportunity for public expression, to destroy this wilderness status and again permit the kind of recreational exploitation that the Park Service now claims has been forced upon it.

Without such an amendment to strengthen it we are convinced that H. R. 3648 will never be more than a gesture as impotent as the early National Park "standards" of Stephen Mather seem to be today.

•

A QUESTION OF DEGREE

It has been interesting to observe the increasing attention given to the subject of wilderness areas during the past ten years. In fact it seems to be a depression-born question, due, no doubt, to a tendency to get back to first principles. This period has brought forth the Wilderness Society and a wilderness philosophy among other groups; has seen discussion of the wilderness question placed on the program of many conservation meetings; has witnessed the creation of a tentative wilderness policy by the Park Service and the Forest Service. From all of this will eventually come a crystallized conception, although with many today the definition of a wilderness seems still to be a question of degree.

We have an interesting case in point in the article in our February, 1939 issue, by Bernard Frank, and an answer to it in this issue (Page 341) by Carlos C. Campbell. Both deal with the wilderness in the Great Smoky Mountain National Park in North Carolina and Tennessee, and we have printed both in the hope that, since they present differing views on the subject, they may give rise to further discussion of it.

In his article Mr. Frank criticized both the character and the extent of the opening up of this Park. "The development of the Park," he said, "is plainly aimed at mak-

ing practically all of its parts easily accessible by road or graded trail". Mr. Campbell, on the other hand, asserts that the Park "now has more of a wilderness aspect than when this rugged mountain area was taken over for administration and protection, in 1931, by the National Park Service."

Both of these gentlemen are right. Since the Park Service took over the Smokies human habitation and commercial use have been eliminated. Substantial areas have been allowed to revert to the wild. But they are not being allowed to revert to wilderness. They are not because these areas are, according to Mr. Campbell, being made easily accessible by "a net-work of carefully planned and carefully built trails, with the necessary feeder roads." Mr. Campbell is correct when he says that the "aspect" of the region is wilderness, but actually the creation of a "network of trails" and "feeder roads" means that, in fact, the area is not a real wilderness, whatever its superficial aspect.

In the interest of fire protection and true wilderness use there must, of course, be means of access. This, however, must be kept at a minimum consistent with safety, and such means of entry to wilderness regions as do exist should be made as appropriate to the primitive character of the region as possible. This is not the case in the development of the Smoky Mountain Park. The doctrine of accessibility, to which Mr. Campbell apparently heartily subscribes, is the prevailing rule. Too many paths, such as you might find in a city arboretum, are taking the place of trails. It is no doubt true that such scarring of the region as they may cause will be obscured by time and Nature, but the fact remains that woodland pathways and a primeval wilderness do not mix.

There are those who feel that we cannot apply the wilderness principles that easily and logically prevail in the West to an eastern park. It is, of course, more difficult because the area has been extensively inhabited and made accessible. Nevertheless, about one half of the Smoky Mountain Park still supports an original virgin forest cover. This, together with reversion of other areas to wilderness, certainly should permit creation of a substantial and compact actual wilderness. But it will never attain that "charm of a primeval wilderness" that Mr. Campbell envisages if the present trail and road policy is continued and extended.

•

ROAD THREATENS QUETICO REGION

BACKED by short-sighted local pressure as well as by power and lumber interests, a renewed drive is being made for a highway along the shore of Lake Superior through the Grand Portage area to the Canadian border. If it is built, it will unjustifiably open up a splendid piece of wilderness of historic and wildlife importance, and threaten the whole principle of the Quetico-Superior program. This proposed road, therefore, becomes a matter of national and international importance.

At the present time Route U. S. 61 skirts the shore of Lake Superior for about 140 miles from Duluth, then turns inland near Reservation River, and, for thirteen miles, proceeds to the Pigeon River on the Canadian boundary. Halfway along these thirteen miles a side road turns off to Grand Portage on the shore. The proposed new road would continue along the shore, cross Grand Portage Indian Reservation land, tunnel or cut through Mount Josephine and continue on to a point near High Falls on the Pigeon River. The Canadian road from Fort William and Port Arthur, recently improved, now runs to the terminus of the present road, and a Canadian continuance of the projected new American road would have to be constructed.

OVER THERE—OVER HERE

Supporters of the project claim that it will provide a spectacular scenic climax. Power interests seeking to utilize High Falls, the largest falls in Minnesota, quietly abet this plan since through it lies their best means to

exploitation. A pulp mill is contemplated at the site of the proposed dam.

The drive for the road started some eight years ago, soon after the groundwork was laid for the Quetico-Superior wilderness by the Shipstead-Nolan Act. Since the road would traverse part of the Indian reservation, it encountered the opposition of the Interior Department, and the State of Minnesota started condemnation proceedings. These were carried to the Supreme Court and invalidated on technical grounds by a decision of Justice Brandeis. The State has now instituted new proceedings in the hope of a favorable decision that will permit the exploitation of this area.

Conservationists, lovers of the wilderness and outdoors, and all friends of the splendid international significance of the wonderful wild area that would be established by Canada and the United States under the Quetico-Superior plan stand firmly against this highway. Straightening of the existing road that meets the Canadian road at the present Pigeon River point is the logical course. Cutting a road into a region rich in wildlife and historic associations, penetrable by trails and destined to become a part of Quetico-Superior, is utterly unjustifiable. Although it would traverse lands now in private ownership, these lands will be acquired in the course of the completion of Quetico-Superior. Nothing as unwarranted or indefensible as this highway should be permitted to endanger this great peace and conservation program—least of all selfish interests.

•

Things to Think About

Purchase of 6251 acres of virgin redwood forest toward an eventual compact national forest redwood area of some fifty thousand acres is being actively urged by the citizens of Del Norte County, California. There is at present no adequate example of the coast redwood forest type in federal ownership. At the same time the Save-the-Redwoods League is actively fighting for a program that will extend the preservation of the magnificent redwoods along the Redwood Highway.

• • •

For some reason newspaper editors delight in publishing pictures of hunters holding, wings outspread, the carcasses of dead eagles. This goes on constantly despite the fact that our national bird, the bald eagle, although protected in many states, is dangerously reduced in numbers. It seems apparent that such pictures are regarded as indicating the "he-man"; the hero. This seems borne out by a recently-circulated picture of movie actor Gary Cooper proudly displaying a golden eagle, which, according to the caption, was said "to have been beating human hunters to wild duck wintering in the mountains near Sun Valley, Idaho."

• • •

Entire reorganization of activities concerned with natural resources and the outdoors was provided in the law setting up a new Department of Conservation in Alabama. Under the Director of Conservation, Dr. Walter B. Jones, are the Division of Game, Fish and Seafoods; Division of Forestry; Division of State Parks, Monuments and Historical Sites. There is an advisory board including certain state officers and eight citizens appointed by the Governor. The game and fish activities are supported by revenue from hunting and fishing licenses.

• • •

Soil Conservation is the monthly publication of the Soil Conservation Service of the United States Department of Agriculture. Its March, 1939, issue is a wildlife issue and serves to bring out the importance of the restoration of habitat for our wildlife, as well as to emphasize the active concern of this service for our birds and mammals. Of particular interest in this issue is the article, "What is a Biologically Balanced Farm?" by Ernest G. Holt, head of the section of wildlife management of the Service.

• • •

Publication No. 75 of the Emergency Conservation Committee, 734 Lexington Avenue, New York, is devoted to conservation news, notes and comments of current application and to an annual report of the committee by Mrs. C. N. Edge. Among other items of interest in this pamphlet is an accurate estimate of Ducks Unlimited. Mrs. Edge entitles the publication *Conservation—Come and Get It,* in order to bring out the thought that true conservation is here for the taking if we only take it.

• • •

Conservation in the United States is a book resulting from the collaboration of four members of the faculty of Cornell University—A. F. Gustafson, H. Ries, C. H. Guise, and W. J. Hamilton, Jr. The book proceeds on the sound theory that a real conservation program depends upon demand for it, and that the demand can only arise from knowledge of the situation and of the need. Starting with the fundamentals of soil and water, the authors proceed to the questions of forest, park and grazing land conservation; thence to wildlife; finally to mineral resources. It is conceivable that fuller justice might have been done the renewable natural resources had the non-renewable been given treatment between other covers. However, the authors have provided an excellent factual foundation upon which to build both wider conservation knowledge and effective action.

• • •

Selection of the design for the 1939-40 "duck stamp" has been announced by the Biological Survey. It is the work of Lynn Bogue Hunt and shows a male and female green-winged teal standing at a marsh edge, while five more teals descend in the background. After July 1 the

stamps will be on sale at post offices singly, in blocks, or in complete sheets.

• • •

"In most of the islands and countries south of the United States song birds may be shot, netted or snared, and nowhere are there laws limiting the number of game birds that may be killed in a day. In six countries there are no bird protection laws and in many others the few statutes are not being enforced. . . . Instruction in the value of birds has no part in the school curriculum. Tens of millions of people in those lands have never seen a pamphlet urging the protection of birds and game. Yet, into those regions, covering more than half of the Western Hemisphere, there annually fly teeming millions of our North American birds, when in autumn the urge to migrate comes upon them."

This is quoted from a leaflet of the International Committee for Bird Preservation, of which Dr. T. Gilbert Pearson is chairman. Faced as we are with much to be done in this country, we must realize that bird protection is an international problem in which fundamental education plays a vital part.

• • •

"Contribution" to conservation progress and to the perpetuation of our national bird as made by an Associated Press dispatch from Amarillo, Texas, and printed in the *Telegram* of Temple, Texas, April 14, 1939:

PANHANDLE HUNTERS MOUNT FAST AUTOS AND GO EAGLE GUNNING

Plentiful Mexican and Bald Eagle Type Provide Leading Sport in Panhandle; Swift Birds Try to Outfly Cars, Often Sailing at 80 Miles per Hour

Amarillo, (A.P.)—The easiest way to kill an eagle is to get near the bird and shoot it.

All it takes is a high-speed automobile, a comparatively level stretch of prairie and a good marksman.

The hunting of eagles has become a leading sport in the Panhandle. Mexican (black) eagles and the bald type are plentiful in the vicinity of canyons, but about the only way a hunter can get close enough to shoot one is in a fast auto.

When an eagle is sighted the driver speeds the car and attempts to run it under the bird. It doesn't take the eagle long to realize it is being pursued. Then the bird tries everything—except the only trick that would save it, take altitude.

The pursued eagle flaps its great wings and tries for speed. If crowded it turns tail to the wind and sails. Hunters who killed six of the Mexican eagles recently reported that one sailed at 80 mi. an hour for several hundred yards.

When the driver gets within gunshot, the man with the gun, that is usually loaded with buckshot, lets go.

Dozens of the giant birds—some having a wingspread of eight feet—have been killed in the Panhandle this winter.

Eagles are carnivorous. When they seize a lamb or rabbit in their long, curved claws they take the victim to the highest point in the vicinity. An eagle never tries to hide. Its retreat is the high open space. All eagles killed by hunters here had blood-stained claws.

The Mexican eagle roosts on canyon walls, their tails extending over the ledge, their heads pointed toward the open prairie from whence any possible danger would approach.

Estimating North America's Waterfowl

Announcement of the January waterfowl inventory was broadcast by the Biological Survey on March 17, 1939. Under the direction of nine regional directors, and with the cooperation of several Federal departments, State game officials and others, the Survey each year, after the close of the hunting season, conducts this stock-taking of North America's waterfowl, at that time wintering in the United States. This "helps take the guess-work out of the job of recommending hunting regulations for next fall", to quote from the broadcast. (No closed seasons—with the duck stamp.)

The estimates for the flocks that came under observation in January, 1939, total about fourteen million. These, it is assumed, represent about twenty-five or thirty percent of the total population.

Well, this operation may take the guess-work out of waterfowl administration, but it leaves a lot of guessing to be done by those who are still worried about the fate of several of our vanishing species. After all, fifty or sixty million waterfowl, representing nearly fifty species of ducks, about eighteen of geese, and two of swans, we guess are not too many for a nation of 140 million people, not to mention the ten million or so citizens of Canada, where most of these waterfowl are raised. We cannot help guessing how many canvasbacks or redheads, or buffle-heads, or ruddies, are left, all species that last year were restored to the game list. We wonder how many of this estimated number were Ross geese, or the eastern snow-goose, or the cackling goose, all endangered species, with small wintering grounds, all in the states.

We note also that fewer geese, counting all kinds, were found this year. We might guess that this is so because during the past two years the daily limit has been five instead of four, as previously; or because there have always been fewer, altogether, than the administrators thought. We cannot know, but we can't help guessing.

We might guess how many geese are killed each year, or how many ducks. No one knows, because those who kill them do not want to tell us, and we do not like to ask them. The killers think it is none of our business. Surely it is a proper concern of the administrator. We might guess why it is that *anyone* should be allowed to kill five or even four great geese in any day, let alone every day for six weeks. This, of course, if they are found.

At any rate we *know* this, that in late years most of us do not often see a wild goose, and that almost as rarely do we hear "the mingled sound of horn and bells" that used to tell us that somewhere, somehow, a beautiful wild creature had survived, to raise her young. And we wonder whether a few privileged ones among our citizenry will this year be allowed to kill, in any one of many days, *five* of these great birds, now *fewer throughout the country*. Many people think that one or two should be enough.

Next month, when we know more about some things, and have done some more guessing, we propose to present some of the facts about waterfowl protection during the past few years, with tables, and explanations.

A REAL WILDERNESS

Trails of Great Smokies protect, as well as reveal, primeval charm of rugged mountains and virgin forests

Says CARLOS C. CAMPBELL

Photographs by the Author

In the February issue of *Nature Magazine* we carried an article by Bernard Frank sharply critical of the character and extent of trail and road building in the Great Smoky Mountains National Park. Mr. Frank pointed out that not only were some of these activities scarring and destructive of beauty, but they were eliminating any possibility of a substantial and authentic wilderness region in this park. Mr. Campbell, official of the Great Smoky Mountains Conservation Association, disagrees with Mr. Frank, and we are pleased to publish his estimate of conditions. At the same time we cannot find ourselves in agreement with certain of Mr. Campbell's premises, and we invite the reader's attention to further editorial comment found on Page 337 of this issue.

THE Great Smoky Mountains National Park now has more of a wilderness aspect than when this rugged mountain area was taken over for administration and protection, in 1931, by the National Park Service.

Timber cutting has been stopped; the area has been protected from forest fires; and hundreds of foot-hill farms are rapidly reverting to forest conditions. Approximately half of the 440,000 acres in the Great Smokies still has the original virgin forest cover. Much of the remainder has already regained part of its former natural beauty, and within a few generations the whole area will again have the charm of a primeval wilderness.

RAMSEY FALLS IS NOW ACCESSIBLE BY TRAIL

Located in the Greenbrier wilderness area, it was not widely known until trail-building made public access possible

A net-work of carefully-planned and carefully-built trails, with the necessary feeder roads, serves a double purpose. It forms an essential link in the plan for protection from fire and from vandalism, and it provides the opportunity for park visitors to see and enjoy the grandeur of the forest-clad mountains.

Any development plan for such an area would, more or less naturally, bring some criticism. Part of the motorists wanted roads everywhere. The ultra-conservationists wanted neither roads nor trails.

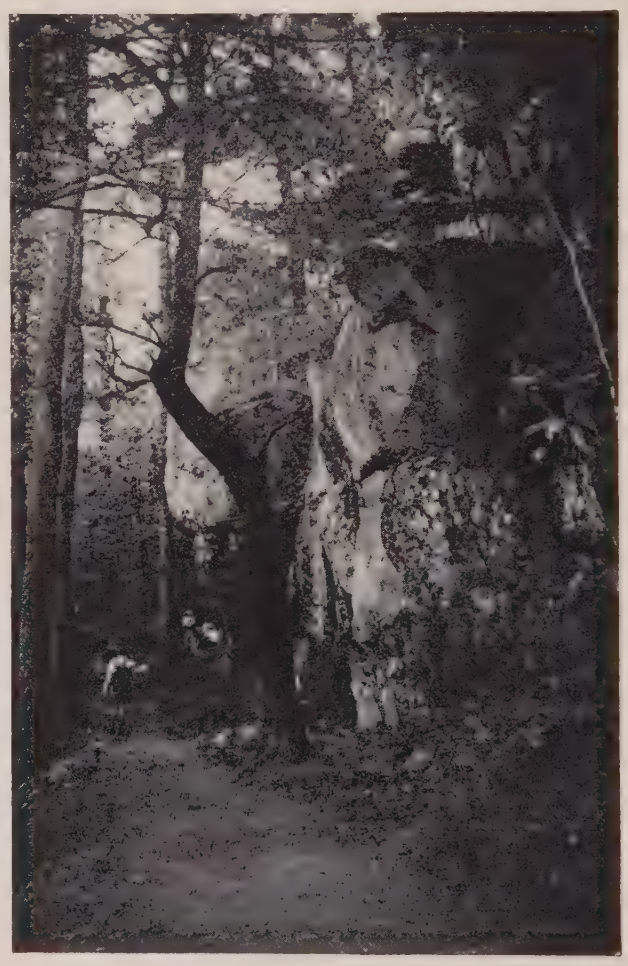
The solution for the problem, presenting such diametrically opposite demands, called for a careful analysis of the situation. Essentially, a National Park is an area with distinctive features of a superlative quality to be preserved for the inspiration, education and enjoyment of the people of the nation.

HIKERS LINGER ON HEINTOOGA RIDGE

This point, at the edge of one of the Park's secondary roads, is the starting point of an interesting hike to the southeastern section

Since timber is never to be marketed from national parks, the value of such areas is of a cultural or esthetic nature, as contrasted with the commercial value of national forests and of privately-owned forest lands. But, to have an esthetic or inspirational value, an area must be accessible. A wilderness that no one can reach could have no cultural value. One that only a few hardy souls can reach has some value, but relatively little. A forest-clad area that many can see and enjoy has an inestimable and far-reaching esthetic value.

National Park Service officials realized these inescapable facts. They knew that there was some merit in the claims of both groups but that neither was wholly practical. To build all of the roads that a few people wanted would definitely ruin the area. To build no roads would deny entrance to a vast majority of the nation's citizens—citizens who may not be able to take a wilderness hike but who, nevertheless, have the faculty for real appreciation of the true values of a primeval wilderness that they may see from the edge of a scenic park road, or on short walks from such a road.



TRAIL TO GREENBRIER PINNACLE

This broad, graded path is typical of the 500-mile network of trails in the Great Smokies Park

An article in the February issue of *Nature Magazine* takes an unwarrantedly critical attitude about one of the scenic roads, and about the trails of the Great Smokies. The author presented a number of statements, some of which were in the nature of half-truths. They led to false conclusions.

It is true, as stated in that article, that a number of trees have been blown down along the Skyway, a highly scenic road to near the summit of Clingmans Dome. The inference that the building of this roadway caused all that tree loss is incorrect. That is one of the half-truths. The chief factor in the blow-down at the end of this road was a severe wind storm that struck that and other areas in March, 1936. That same storm did a far greater damage, levelling a much larger area, on Forney Ridge near Andrews Bald. That larger blow-down is a mile or more from the road, and is not reached by a graded trail.

On the east slope of Richland Mountain, in the northeastern end of the Great Smokies, there is another blow-down still larger than the one near Andrews Bald or the one at the end of the Skyway. The Richland Mountain blow-down was caused by a wind storm in 1935. That spot is several miles from a park road and some ten or twelve miles from the other two just referred to. The nearest trail is on the opposite side of the mountain.

Anyone who has hiked much in the Great Smokies, even in the pre-park days, can recall numerous blow-downs. Within a half-mile of the mountain-top lodge on Mt. LeConte there are at least two blow-downs that occurred long before any trails or cabins were built on that grand, forest-clad mountain.

These blow-downs are cited to show that the construction of the Skyway, to near the top of Clingmans Dome, probably had little or nothing to do with the blow-down at the end of that road. Wind of a sufficient velocity, and there are occasionally such winds in the Smokies, will take its toll of trees wherever it hits, irrespective of trails, roads or other developments.

While most of the tree losses along the Skyway were obviously caused by windfalls, there has also been some loss due to excess drainage resulting from road construction. There is no escape from this loss, but there is a strong probability of a gradual natural readjustment that would justify that loss, even if making the area accessible to great numbers of Nature-loving people did not justify it.

This readjustment has already started. With the increased light that falls upon the edges of the roadway, grasses and shrubs have gotten a good start. These are the same grasses and shrubs that follow the trees where blow-downs have occurred. They are just as much a part of Nature's plan for the region as are the spruce-fir forests which so richly adorn the higher crests of the Great Smokies, or the stately hardwood forests of the lower and intermediate elevations.

Many people believe that the picturesque grassy balds, which add so much beauty and interest to the southwestern portion of the Great Smokies, were caused either by clearings, or by wind-falls such as recently occurred at various points throughout the Smokies. These grassy balds, or mountain-top meadows, are generally recognized as being among the most beautiful spots in the park.

Could it, then, be so very tragic if, in the natural course

of plant succession, grass and shrub-covered strips should replace a few spruce and fir trees along the edge of this one scenic road? And, no other crest-line roads are contemplated for the Smokies.

Reference is made in the article in the February issue of *Nature Magazine* to Indian Gap. Obviously, this beauty spot is not quite as attractive as it was before the Skyway to Clingmans Dome was built. The difference, however, is not nearly as marked as the two pictures on page 100 of that issue would indicate. It is easy to see that the smaller picture (representing the "after taking" phase of the story) is a winter picture, with patches of snow. It is not a fair comparison.

But, admitting that this later road did somewhat mar the erstwhile beauty of Indian Gap, let's look a little further back. What was the original condition at this Gap? Anyone who has traversed the main crest for a few miles on either side of Indian Gap, and who has done so with open eyes, will at least guess that this Gap, like others within a few miles of it, originally had a forest cover—probably beech, birch or spruce, or a mixture of these trees. Recent investigation proves this to have been the case. Men still living in the foothills of the Great Smokies recall hearing their fathers and grandfathers tell how the Indians cleared the trees in Indian Gap and established a construction camp there, when they built the old road across the mountain in Civil War days. One of these old-timers tells that during his boyhood days the Gap was covered with stumps. Another recalls that in 1896 the open space in this Gap was almost twice as large as it is now. Even in the absence of such first-hand information, it would be easy for any observing Nature student to see these facts in the trees that now form the fringe around the Gap. Most of these spruce trees are young and beautifully-shaped, with still younger ones making further encroachment. Such a fringe of young spruce, with grass in front of it, will doubtless grow along the edges of the Skyway. And, who would say that this replacement would not be equally as attractive as the more mature trees that were sacrificed in the road's construction, or as a result of the wind storms?

As previously stated, a wilderness that no one could see would have no cultural or inspirational value. One that many can see and enjoy has an inestimable and far-reaching esthetic value. Such values more than justify the slight tree loss that has resulted along the Skyway—even if this loss should not be counter-balanced by the natural changes that will follow.

Much was said about the graded trails of the Great Smokies. They are referred to as celluloid trails and horse trails. The fact remains, however that these trails are serving to introduce a far greater number of hikers to the charm of the Smokies than the old trails ever could have done.

TWO TYPES OF TRAIL COUNTRY

Above, the Alum Cave trail to Mt. LeConte leads through rhododendrons, and, below, a bit of the spectacular trail around Charlies Bunion, a peak lying four miles east of Newfound Gap

In 1933 one of the ultra-conservationists made his first visit to the Great Smokies, in company with three Knoxville hikers. The approach was by the old Road Prong trail, an abandoned wagon road—the same road that caused Indian Gap to be a grassy spot instead of retaining its original forest cover. The charm and beauty of the immediate trailside won the enthusiastic praise of the visitor, as it does all who traverse the route. Many times he stopped to admire the moss, grass and shrub-carpeted banks both above and below the trail. In grading that old road the banks had been left excessively steep in many places. But, however steep the banks, they are all richly-carpeted with mosses, ferns, grasses and wildflowers.

After the party reached the main crest, it followed the Appalachian Trail eastward to Newfound Gap, where a scenic highway (built by the two states—Tennessee and North Carolina—before the park was established) crosses the mountain. From Newfound Gap a newly-graded trail led eastward, approximately along the state line or main crest. That trail is a part of the Appalachian Trail, estab-

END OF THE SKYWAY TO CLINGMANS DOME

Most of the occupants of the parked cars are following the trail to the observation tower on the summit, where splendid views await them

lishment of which this visitor was first to suggest. This trail, four feet wide and not exceeding fifteen percent in grade, had been built just a year earlier. It was a new trail, and little plant life grew on its gently-sloped banks.

The visitor's outburst against "these man-made scars" was very bitter. He was reminded that just an hour earlier he had given high praise to the old Road Prong trail, and that it was also once a "man-made scar", more than twice as wide as the new trail of which he was so bitterly complaining. Also, his attention was called to the fact that the sides of the old road—now a beautiful trail—had been left with abrupt banks, whereas the banks of the new hiking trail (or, horse trail, if you prefer) were sloped gracefully to fit the natural contours of the mountain. He was asked if he did not think that the banks of the new trail would, within a few years, be covered with mosses, ferns and wildflowers, just as had the banks of the old Road Prong trail.

None of these things seemed to make any impression on the visitor. All he talked about was the "great crime" of building graded trails. This is typical of the attitude shown by a small but vociferous group that has criticized practically every move made by the National Park Service in the development of the Great Smoky Mountains National Park. They seem to be allergic to anything that is done by the National Park Service.

Admittedly, there is room for argument about the desirable width of trails in the park. In many cases the narrower trails have a more primitive and a more picturesque quality. It is the plan of the National Park Service that the trails yet to be built shall have only a two-foot tread, with sufficient clearance to permit their use by horseback riders as well as by hikers.

It must be remembered that these trails were built for the fire protection that they afford, as well as for use by hikers and other park visitors. This is one of the reasons for having the main trails four feet wide. There is another good reason. In many cases it is much more enjoyable for hikers to walk two abreast than in single file. This permits easier discussion of the things of interest that are seen along the way. Much is learned about the flora and other phases of natural history, and about the place geography of the mountains, through such conversations by hikers as they traverse the trails.

The author of the article in the February issue of *Nature Magazine* and some of his fellow-extremists claim that the graded trails are ruining the Great Smokies. I believe that an overwhelming majority of park visitors—people who enjoy the primitive charm of the mountains just as keenly as do the extremists—will agree that, on the contrary, the trails really serve to protect this rugged wilderness, as well as to reveal its beauty for park visitors. It keeps the visitors on dependable routes instead of scattering them over untrailed routes where they would do actual damage to the flora over which they would trample. Or, if they should follow paths made by others, those paths too often would become gullies or small ravines. The heavy rainfall of the Great Smokies makes it necessary to have properly-drained trails to prevent serious erosion.

Many of the old trails washed so badly that they became hazardous to the users. The ungraded section of the Appalachian Trail along the crest of the mountain between Collins Gap and Clingmans Dome is an example. The old trail from Cades Cove to Gregory Bald is another. There, as soon as the trail became too much of a ravine to be usable, hikers started another trail alongside the old one. That likewise soon became a ravine. Many similar situations existed in the pre-park days.

The National Park Service not only had to build properly-placed and properly-drained trails, but also had to do considerable erosion control work to prevent further damage on the old trails.

Another advantage of the graded trails is that they permit the users to see the things of interest along the way instead of having to keep their eyes glued to the footway. It enables them to relieve their eyes from the task of hunting for safe places for foot-steps, and to use them for the more enjoyable and more inspiring function of bringing to the attention more of the surrounding charm and grandeur.

For those who still like to push their way through an untrailed wilderness, there are more ridges and streams, not traversed by even a primitive trail, than could be covered in a whole lifetime of hiking. And, on such untrailed routes, these super-wilderness devotees are less likely to come in contact with other people than before graded trails were made for the (Continued on page 353)

ELBERTA CLARK WALKER MEMORIAL POEMS

In 1925 Robert Sparks Walker, Tennessee naturalist, writer and poet, established the Elberta Clark Walker Memorial Nature Poetry Contest in memory of his wife. The Chattanooga Writers' Club, of which Mr. Walker is a member, assumed the responsibility of conducting the contest, judging the entries and making the awards. The 1938 contest was in charge of Mrs. James A. Burrow, who enlisted the cooperation of Nature Magazine in printing the five prize-winning poems. Readers interested in the 1939 contest should write to Mrs. Cyrus Griffin Martin, 412 E. 2nd St., Chattanooga, sending a three-cent stamp.

First prize in the 1938 contest was awarded to Lillian Mayfield Wright of Erwin, Tennessee, for her poem, "Sunday Afternoon", reproduced on this page. Second prize went to Gordon Le Claire of Montreal, Canada, for "Pheasant in Profile". Third prize was awarded to John W. Comrie of Los Angeles, California, for "A Sonnet on the Grand Canyon at Sunset", fourth prize to Bessie M. Barker of Regina, Saskatchewan, Canada, for "The Hawk", fifth prize to Sara D. Lewis of Los Angeles, for "From a Pen." An anthology of past prize poems has been published by Mathis, Van Nort, Dallas, Texas, at $2.

•

Sunday Afternoon

By LILLIAN MAYFIELD WRIGHT

The path begins along the pasture fence
Where wild blackberries lean against the pines
Cut once, and then burned over, making now
A thick green hedge where chipping sparrows nest
To whir aloft with thin sharp cries of grief
At your approach.

Tall holly trees and pines
Come out to meet you as you near the wood
Where brown pine needles, soft and slippery,
Build up their annual carpet for your feet.
A fallen log with moss upon its side
Gives you a couch, inlaid with jade, and there
You can believe that time has passed you by
And left but these: the path, the wood, the stream
Of discontented water, grumbling near,
And looking up through canopies of pine
You see a cloud go by—a ship full sail
Upon a deep inverted sea of blue.

The cloud goes on, trailing its shadow cloud
Upon the trees for anchor, touching you
With fingers wraith-like and intangible,
As the forerunners of the coming storm
You feel and hear, but cannot yet perceive.

A thrush cries, deeply, in the deeper woods,
And close at hand the answering echo comes
To tune another voice still farther on—
And on—and on; the mockingbird's sheer joy,
The sharp word-music of the cardinal,
And in the willows drooping by the stream
The aimless warble of the vireo.
Then they are gone.

The cloud is blacker now
Tinting the pines a richer, darker green,
Deepening the shadows on the holly leaves,
And lending to the still complaining stream
A voice of louder, clearer resonance.
The wind comes nearer, and you smell the damp
Of rain, so close that suddenly a drop
Touches your face, and on the laurel leaves
A pattern grows, etched on this shining green.
The ships have gone by, now. The sky is gray,
Except where a swift flare of lightning tears
The mist apart, and shows upon the hills
The thin black fingers of the reaching trees,
Holding the wind.

The boughs are bent and lashed
By wind, escaping, and in open woods
The rain lets down a curtain of pale gray
To wave and billow through the shimmering trees.
And then as swiftly, gently, as it came
The storm is gone. The sun comes out again,
And every little leaf and blade and flower
Is washed and dried to sparkling loveliness.
The birds come back. The needles on the path
Are softer and more slippery than before.
The trees drip on your shoulders, and a squirrel,
Dry, sleek and pompous, sits upon a log
Watching you, restless, as you tiptoe by,
But scorning flight.

At last the pasture lane
And grasses, heavy-headed, reach for you
With smooth wet fingers as you hurry by,
To turn into the barnyard, where the cow
Puts out a curious and inquiring head,
From the barn window, and moos softly, once.

Pheasant in Profile

By GORDON LE CLAIRE

Jeweled head erect, he brushed aside the fern,
Breaking the strands of crystal filigree
Spiders had webbed; flanks grazed at every turn
By frond and leaf, in vivid majesty
He paused to drink the dawn's cool vial of fire,
Light splashing on his burnished wings and breast,
A feathered monarch, flaunting garnet crest,
So near I saw the beating of his heart
Quiver the beryl breast-plumes he would preen.
Then suddenly some instinct made him start
As if he sensed Death lurked behind the screen
Of brake. Like flame from cannon jaws he ran,
A streak of drooling color through the furze,
Gemmed pinions spreading out a spangled fan
To cleave the blue like fiery Lucifers
That limned their brilliant signet on the sky.
A rifle thundered. Torn wings swooped to earth.
The taut flight ended as an emerald thigh
Spurted with ruby stain that smeared the girth
Pained eyes were softened as they watched it spread,
Eyes awed and large with wisdom; but still proud,
He challenged even Death with upraised head
Until limp feathers formed a jeweled shroud.

•

FROM A PEN

By SARA D. LEWIS

I am afraid to write of Nature
I who have drilled through granite souls,
Unclothed modest hearts,
Dripped paganism into holy minds—
I who have lauded the home,
Shaken beauty from figurative stars—
Dare not touch a tree
Or a flower
I am not equal to it.

Stay Nature outside.
Let the sun and rain feed the earth.
Let the amazing birds construct
  havens from twig and string,
The tamarisk lean against a red-striped heaven,
Coquettish winds maul lemon-yellow sands,
Coral-mouthed shells drink briny water,
Measuring worm huddle a plump back for another step,
Vermillion apples roll among autumn leaves,
Erudite moon grin upon rumpled shadows—

But write of Nature?
Kindle redolent hills and jeweled rivulets
With papered words?
I am too humble—
It is a task for God.

•

A SONNET ON THE GRAND CANYON AT SUNSET

By JOHN W. COMRIE

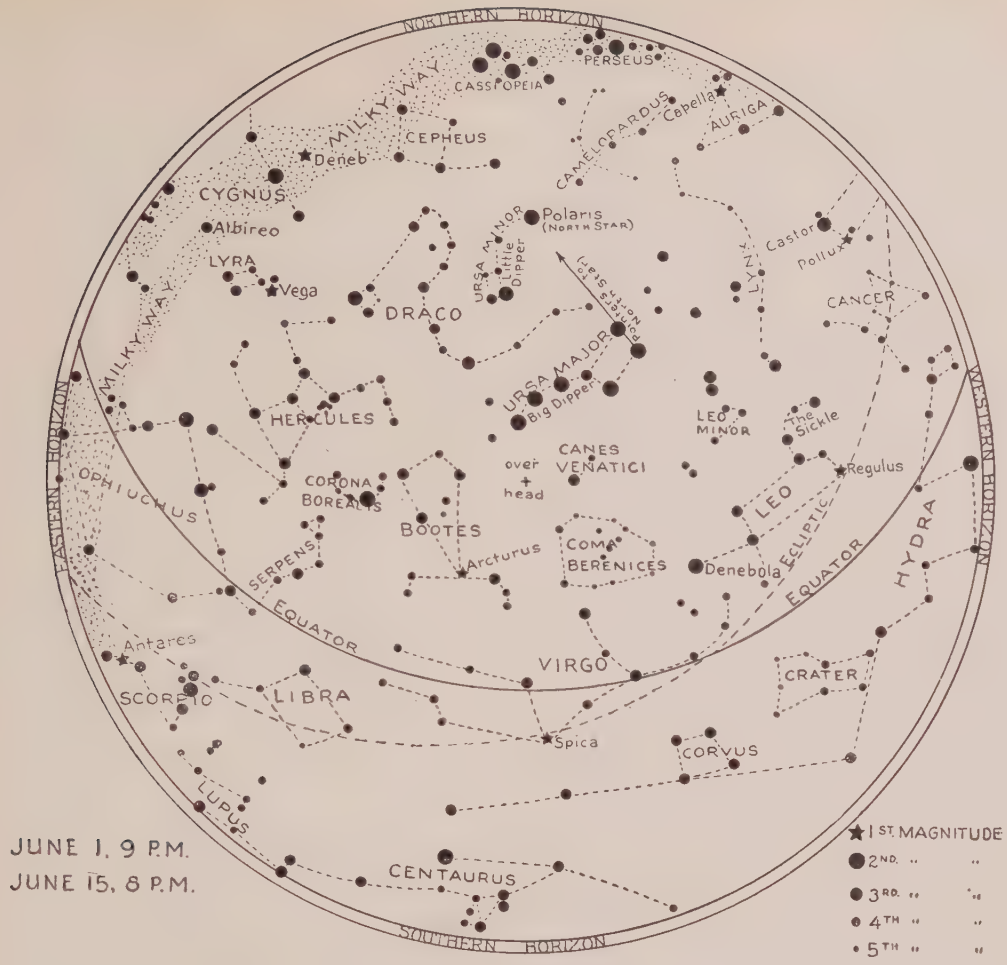
Such might and majesty do here unfold
In panoramic splendor deep and wide,
The startled mind amazed can scarce abide
To dwell upon such grandeur, hardly hold
This awe inspired. Words fail: and now, behold,
The sun, outshone, his head unworthy hide.
The spirit soars, while shrinking doubts subside,
In Nature's greatest masterpiece consoled.
The clouds hang motionless and daylight fades
Beyond the western wall where earth and sky
Are interfused in flaming red sublime
Amid these ever-changing lights and shades.
Red turns to purple, darker still, and I
Turn back from magic never wrought in rhyme.

•

THE HAWK

By BESSIE M. BARKER

You feel no boundaries, bird of swamp and plain,
Beyond the far horizon's endless rim;
While I, with human vision vague and dim,
Am land-locked, cloud-pent; dust and fog and rain
Wrap me within their low hung, trailing shrouds;
But you, shut out from all the world below,
Rest on your outspread wings while turning slow
In sunshine hid above the rolling clouds.
Master of heights, what power you hold in fee,
When, in the dreamy warmth of summer days,
You wing the wildness of unchartered ways
In space unlimited; now as I see
Your shadow on the waving grasses run—
My spirit longs to rise, to sway—and swing—
To soar with you on broad, untiring wing,
And wheel in widening circles to the sun.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Heavens in June and July

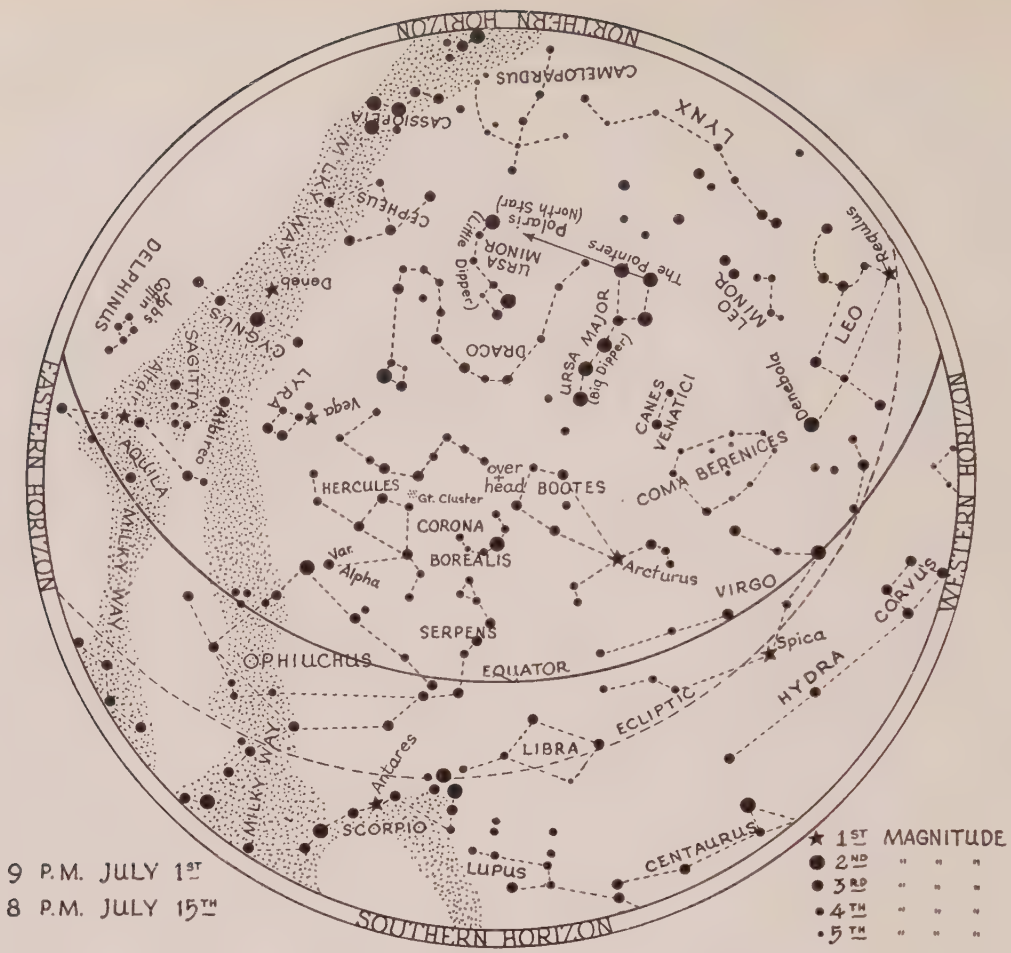
By ISABEL M. LEWIS

THE most interesting object in the evening sky this summer will be the ruddy planet, Mars, which will be in opposition to the sun on July 23 and nearest to the earth a few days later on July 27.

This opposition of Mars is one of those exceptionally favorable ones that come only at intervals of fifteen or seventeen years. The last favorable opposition of Mars occurred in August, 1924, when the planet came within 34,500,000 miles of the earth, which is the closest that it has ever been known to come. This year the distance of the planet from the earth at opposition will be about 36,170,000 miles, and this will decrease to 36,033,000 miles on July 27. From June 1 to July 1 its distance will decrease from about 55,300,000 miles to 40,780,000 miles and the planet will steadily increase in brightness up to the date of nearest approach to us. Then it will outshine all stellar objects in the heavens with the exception of Venus. On the stellar magnitude scale its brightness at that time will be —2.6; that of Jupiter at its best is —2.6; but on that date the brightness of Jupiter will be —2.2, so this will be one of the rare occasions when Mars will be brighter than Jupiter. The brightness of Venus on the same scale at this time is only —3.3, considerably less than its maximum brilliancy on the stellar magnitude scale of —4.4, yet even when faintest it far surpasses all other stellar objects in splendor. Sirius, the brightest of all the stars, has a stellar magnitude of —1.6.

The great brilliance of Mars on these rare occasions is all the more noticeable because the planet varies so greatly in brightness at different points in its orbit. When farthest from the earth it is not even as bright as a star of the second magnitude. Early in June Mars will be moving from west to east, which is the usual direction of motion for all the heavenly bodies and is spoken of as "direct motion". On June 24, however, the planet will reach what is called a "stationary point" in its orbit, when it will appear to be stationary in position relative to the stars.

After that date Mars will "retrograde", or move west-



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

ward, contrary to its usual direction of motion, until the latter part of August. Throughout this period Mars will remain in the constellation of Capricornus, and will, unfortunately for those in our latitudes, be so far south that this will not be such a favorable opposition for the study of its surface features as that of fifteen years ago. The planet will be seen to the best advantage in the southern hemisphere and within the tropics. This little world, which has less than one-third of the surface area of the earth, is one of the most fascinating objects in the heavens to observe. Viewed through the telescope with a power of only 75 when nearest the earth it appears as large as the moon does to the naked eye and it is then a most beautiful object with its surface diversified with orange-colored or ruddy and greenish or dark gray markings, and whitish spots that imply the presence of clouds and storms. Surrounding the poles are polar caps that increase or dwindle in size with the seasons and one may see also the strange "canals" that may be strips of vegetation bordering on waterways. The reddish regions that give the planet its ruddy color are probably great desert areas on which no vegetation grows. Those who are interested in studying the surface features of the planet usually carry their observations over a period extending two or three months before and after the date of opposition, and many drawings and photographs are made of this little neighboring world during this period. Of all of the planets of the solar system, beside the earth, Venus and Mars are the only two that may be seriously considered to be capable of supporting life. Since Venus keeps its surface perpetually screened from view behind a dense atmospheric cloud we turn with all the more interest to the easily observed and intensely fascinating surface features of our other next-door neighbor in space.

Mercury will not be seen during June as it will be in superior conjunction with the sun on June 7 and poorly placed for observation throughout the month. It will be at greatest eastern elongation on July 13, however, and will be quite well placed for observation for a few days before and after that date in the evening twilight.

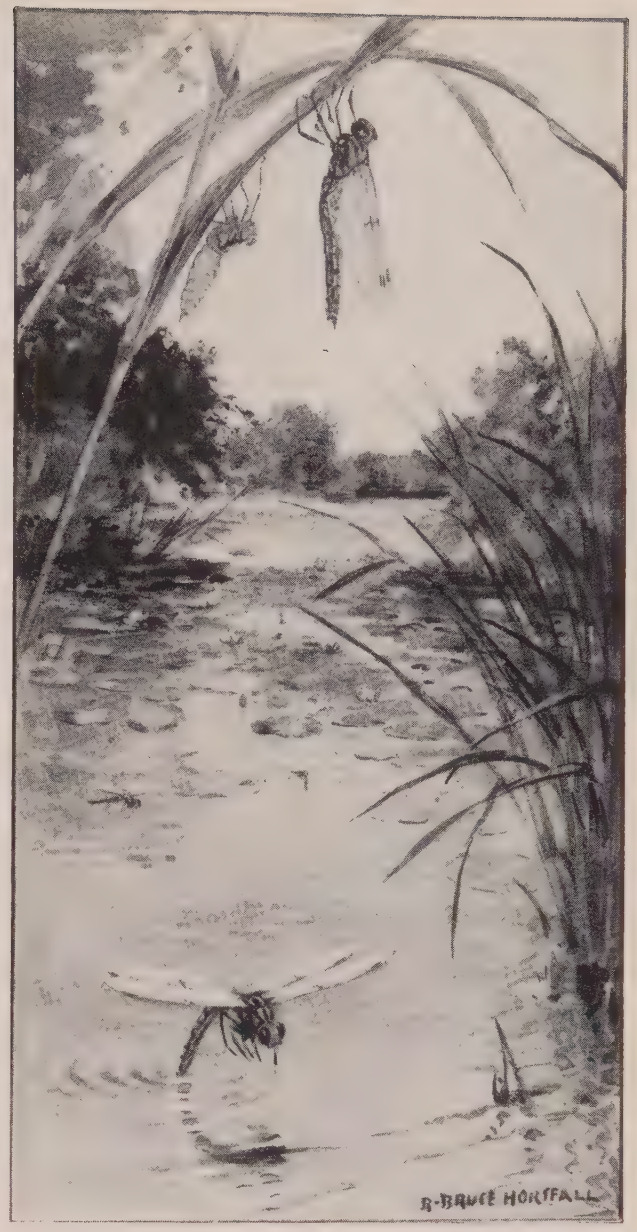
Jupiter will temporarily yield to Mars in splendor in July. It will be in quadrature on June 29, and will then be on the meridian at sunrise and visible all of the second half of the night in the eastern sky. In July it will come into the evening sky, and during the two months will pass from Pisces into Cetus.

Venus will remain in the morning sky in June and July but is approaching superior conjunction and rises less than an hour before the sun. Saturn is well placed for observation in the morning sky in Pisces and will be in quadrature and on the meridian at sunrise on July 24.

A Dragonfly Cosmopolite

By CARSTEN AHRENS

Illustrated by R. Bruce Horsfall



BECAUSE he hasn't a common name (at least I've never heard one) I'm going to call him "Rusty". The scientist will disapprove, because in dragonfly literature Rusty becomes *Sympetrum corruptum*. And, really, Rusty isn't a particularly good name for him until he grows old.

As with all dragonflies, the early months of Rusty's life were spent in the water. His mother had sailed slowly over the surface of a quiet pool; now and then she splashed the water with the tip of her abdomen. Each time a few eggs would slowly sink to come to rest on the submerged pond vegetation. The water was warm, and in a few weeks, Rusty, an almost microscopic creature, hatched from one of the eggs. He grew rapidly and frequently changed his old skin for a new coat that grew just under the old. After a number of moults, he developed wing pads. During this period he was certainly an ugly, spidery-looking chap with bulging eyes and a voracious appetite. He would cling motionlessly to some water weed until a luckless victim swam by, then, with lightning-like swiftness, out would shoot his jaws (which are so large as to be out of proportion to the rest of his body) and another minnow or larva was doomed. Often when other food was scarce, he would turn cannibal and devour his own brothers. Then, early one morning, he crawled from the water and left his dragon-like covering clinging to a reed, while he, after the sun had dried his spreading wings, soared into a new life with a grace scarce possessed by any other insect. Gone was all ugliness. He had become a being with gleaming wings and an entirely different breathing apparatus; only his amazing appetite is carried over into his new existence.

When he leaves the nymph or aquatic stage, he becomes a creature with a yellow thorax and abdomen, but as days pass he becomes rusty red except for two yellow spots on either side of his thorax. His brown-veined wings are transparent and the stigma (the brace on most dragonflies' wings near the apex) is a solid brown that shades into yellow toward the ends. He is a dainty little fellow, rarely two inches long, and his wing-spread barely extends to two inches and a half. While some dragonflies are on wing for only a few weeks of each year, Rusty flies from April to September. Dr. Needham of Cornell University is of the opinion that Rusty hibernates, perhaps after the fashion of the mourning-cloak butterfly.

Rusty is not confined to the West. I have collected him in Ohio and Pennsylvania, and he has been reported in Connecticut, so, perhaps, when we learn more about him, he will be found to inhabit most of the forty-eight states. Scientists become enthusiastic when they discover an indicator. By an indicator they mean a species of plant or animal that has adjusted itself so absolutely to those conditions that support life in a particular life zone that it can live in no other. Rusty would never make an indicator, for he ignores life zones. Then again, most dragonflies can be placed into one of two divisions—they are found about the running water of streams and rivers, or they seek the standing and often stagnant waters of pools, swamps, and lakes. Here, too, Rusty does not conform, as is proved by my notes made on a 9000-mile trip through the West.

He was skimming the ponds and roadside ditches as I crossed Iowa. He was squatting on the bare earth in the lovely desolation of the ash-pink-rose-tan-chocolate of the Bad Lands of South Dakota. I found him in the evergreen forests of the Black Hills of the same state. He was netted as he wavered over the cactus and sage of Wyoming, and I saw a pair in the Lower Geyser Basin in the Yellowstone National Park. He was flying above pools of salt water on the seemingly endless salt plains of northern Utah.

Perhaps he was as confused by the strange mirages as I. He was on wing amid the fantastically-carved and bizarrely-colored rock formations of Bryce Canyon and Zion National Parks. He was frequently collected on the desert vegetation of Nevada, and I saw him with his wings pressed against the cement of Boulder Dam when the temperature was 120 degrees F. I believe it is generally true that dragonflies are found in the vicinity of water, but I would also meet Rusty in truly desert places.

In Yosemite National Park, where I hiked, studied, and collected for seven weeks, I learned that while Rusty is no idolater of swamp or pond or stream, neither is he a respecter of altitude. He was common along the Merced River in the meadows at the foot of El Capitan, but when I climbed the Snow Creek Trail to that divine high country of the Sierra Nevadas that can be reached only by foot and with pack, he was there to greet me. In evergreen forests, over bare granite slopes, and along swift rivers, he was plodding along. On cold rainy days he would vanish to "hang himself up" beneath a thick cluster of pine needles or on the protected side of a cliff. But should the sun peep through the clouds for only a few minutes and drench the valley with a watery sunshine, he would be one of the first insects to continue his restless flight. He catches and devours countless mosquitoes and other small insects as he flies, but if he captures a large robber fly, he carries it to his favorite perch, there to consume it more leisurely. I climbed to altitudes where snow lay, and lakes hold ice the year around. On the snow patches and glaciers of Ragged Peak, North Peak, Mt. Dana, and Mt. Conness, I frequently found lifeless yet perfectly preserved specimens of Rusty. When we dropped down from the Park to Mono Lake, Rusty was flying about the springs that help to feed that saline lake, but I never saw him venture over the water for any distance.

Rusty was just as numerous when we dropped down on the Western side of the mountains into the fertile valleys of California. He proved himself to be a cosmopolitan chap, for I found him unchanged in appearance and habits when I crossed the boundary and drove down Baja California way.

When I hiked the Bright Angel Trail on my way down the Grand Canyon to the Colorado River, I saw Rusty several times, although I gave him only a glance for there was so much that was almost unbelievable. But while resting at Phantom Ranch, a short distance from the giant river itself, and a mile below the Rim, my companion disappeared and shortly returned with a "rare specimen" as he called the object he carried in his hat. I carefully opened Mark's improvised collecting net and there, sure enough, was my old friend Rusty.

I visited twenty-two states and Baja California on the trip and collected many different species of dragonflies, but Rusty was the only species that was found in all of the states. When I returned to Pennsylvania, I found a package of dragonflies from my little friend, Jimmie Keller of Idaho, and, like an agreeable Nemesis, in the first envelope I opened was . . . RUSTY.

•

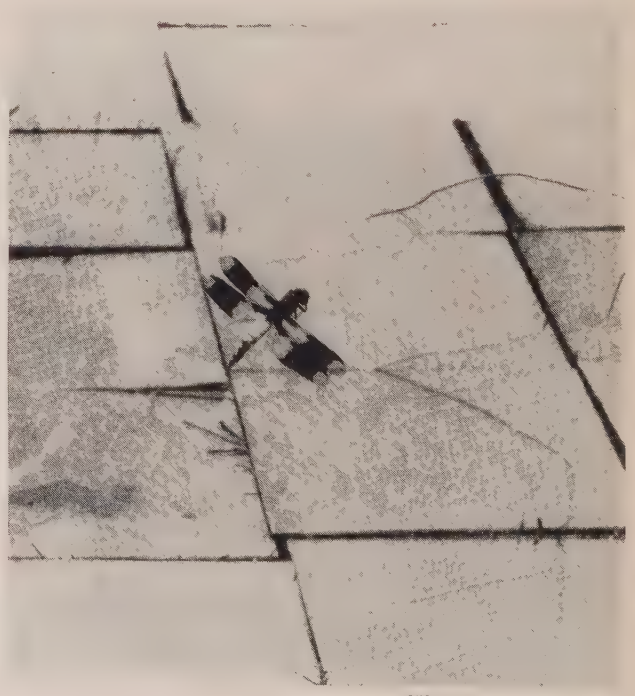
Fooling a Dragonfly

By HENRY S. CONARD

It was my privilege to know a good deal of the life and work of that kindly soul and distinguished photographer, the late Cornelia Clarke. She talked little about her work, but when she did she seemed always to bring out some surprising item. She told me once of securing dragonfly eggs for photographing:

"Of course, the larvae and the nymphs of dragonflies are easy enough to get. I had them in my aquaria. I had watched them crawl up a stem, split their skins, and come out as full-grown flies. I had all the photographs I wanted of these stages. But how could I get the eggs? The mother dragon fly lays her eggs without ever stopping in her ceaseless flight. As she flits over a pond, she dips down to the surface every few seconds, and pop go the eggs. They immediately sink to the bottom. With this knowledge, I went to a pond. The dragonflies were laying eggs. I whisked my net under them repeatedly, but never succeeded in getting an egg. They were too quick for me.

"One day I had washed a number of five-by-eight glass negatives and laid the clear, clean glasses close together in a large plot on the lawn to dry. Chancing to look out the window, I saw that Mrs. Dragonfly had mistaken



PHOTOGRAPH BY CORNELIA CLARKE

my sheets of glass for water. You might do as much yourself. And there she was dipping at the photographic plates. As soon as she was gone, I hurried out and there were eggs a-plenty."

A GATHERING OF BIRDS

Edited by
Donald Culross Peattie

The book every bird lover has been waiting for—the best that has been written about birds by the great ornithologists of the last 150 years, included in a single volume!

For each writer Mr. Peattie has contributed an introductory biography and appraisal, and Edward Shenton (who illustrated *The Yearling*) has provided full-page drawings. All selections were chosen on the basis of their literary appeal as well as their information about birds. The contents include Hudson on the English jackdaw and the golden plover of the pampas; John Muir on the ouzel; Gilbert White on the swift; Cherry Kearton on the penguin; Gustav Eckstein on the canary; Buffon on the nightingale; Nuttall on the mocking-bird; William Beebe on the hoatzin; Alfred Russel Wallace on the birds of paradise; Chapman on the flamingo; Thoreau on the loon, the gull and the thrush; Audubon on the trumpeter swan and the passenger pigeon; Wilson on the ivory-billed wood-pecker; Sir Edward Grey on the taming of birds; Richard Jefferies on birds near London; Peter Kalm on the humming-bird; Elliott Coues on the swallow; and Robert Cushman Murphy on the guanay, the most valuable bird in the world.

379 pages. $3.00

NATURE BOOK DISTRIBUTORS
1214 Sixteenth St., N.W., Washington, D.C.

Enclosed is $..... Please mail me postpaid Donald Culross Peattie's "A Gathering of Birds".

Name .....

St. & No. .....

City & State .....

INDOORS AND OUT

(Continued from page 303)

Gayle Pickwell says that his recent volume *Birds* (Whittlesey House, $3.50) "is not intended as a manual for identification of birds. It explores the great field that remains after the name of the bird is known." His intentions are insured by the fact that the book stands nearly a foot on the shelf and has a width of nine inches; it is indeed no manual. This format, however, permits the enlarged treatment that Dr. Pickwell's excellent photographs deserve. These photographs are the volume's best feature, yet the text is an excellent comprehensive and introductory discussion of the entire subject of birds. I should like to see Chapter I widely distributed, an exhortation to know the birds in order "to grant they have interest and a right to live" and "because the knowing gives pleasure and satisfaction."

But one volume remains in this "gathering of books", and it is certain to be most welcome. Donald Culross Peattie has in recent years both perfected an excellent style of his own and explored the whole literature of Nature writing. His most recent volume, *A Gathering of Birds* (Dodd, Mead and Company, $3.00), brings to Peattie's many readers a new and superlative combination of these accomplishments. For this is an anthology in which Peattie chooses from the writings of nineteen "who have written admirably on birds", and for each of these writers Peattie has provided intoductory, biographical sketches that also are "written admirably", and comprehensively enough to be of value as well as of interest. The writers included are each represented, not by brief quotations but by unit selections, and thus the book is indeed a gathering of birds. Audubon, for example, is represented by his writing on the phoebe quoted here in April, on the trumpeter swan, and on the passenger pigeon. It has been a long time since I have read a book from cover to cover with more pleasure than I have *A Gathering of Birds,* and I presume that I shall also be rereading it frequently, and using its index.

A Snake Guide

What Snake Is That? is a much-needed book. Written by Roger Conant and William Bridges, this little volume is a guide to the identification of snakes found in the United States east of the Rocky Mountains, and fills a gap in the reptile bibliography. Simplified, the material condensed into a form useful to the layman, printed in a handy size, this book is exactly what we have been wishing to be able to recommend to readers asking for a good, handy and simple reptile text. Our thanks to D. Appleton-Century for publishing it at the reasonable price of two dollars.

For Cat Lovers

Owners of pedigreed cats, of course, devote much thought to the proper care of their pets, but too often the "just cat" is none too well cared for, even though its owner may think it is. This is due in many cases to lack of information, and that information is admirably supplied in *A Practical Cat Book* by Ida Mellen. Treating with breeds and breeding, and with the care of the cat from kitten to old age, this volume should find a welcome audience. It is written against a background of a quarter of a century of experience. It is published by Scribner at $2.50.

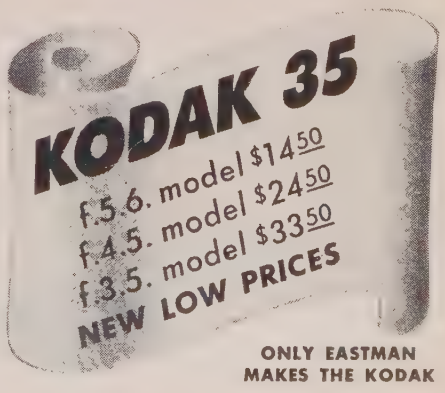
HERE'S a miniature to take to the Fair, on a sea voyage, to the country or the shore—in fact, wherever the snapshooting's good.

Choosing any one of the three modestly priced models, you're equipped for splendid snapshots; Kodak 35's have fast lenses, precision shutters, up-to-date picture-taking features. You get up to three dozen little 35 mm. pictures on a single loading. (35 mm. pictures, you know, can be made into stunning enlargements.)

And in addition to black-and-white pictures, you can make gorgeous Kodachrome (full-color) transparencies. At your dealer's . . . Eastman Kodak Co., Rochester, N.Y.

DETAILS—All three models have Kodak Anastigmat lens and precision Kodak shutter, eye-level finder, finger-tip focusing, automatic exposure counter, film-centering and locking device. *F*.3.5 and *f*.4.5 models have double-exposure prevention; clip for Kodak Pocket Range Finder.

GOING TO THE NEW YORK FAIR? Take your Kodak—visit the Kodak Building—see the Greatest Photographic Show on Earth.



ONLY EASTMAN MAKES THE KODAK

THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Summer Season Suggestions

Camps and summer schools are important items of interest to readers of this page at this season of the year. The camps may be of the informal type where a few kindred souls may "rough it" and thoroughly enjoy themselves, or they may be of the organized type where "instruction and guidance" are provided at so many dollars per.

Some camps provide superior opportunities for young and old to appreciate the problems of the outdoors. These camps generally have well-trained enthusiastic counsellors in Nature fields and a good assortment of equipment with which to explore. Dredges, nets, soil borers, geology picks, insect-trap lights, bird-banding equipment, well-selected supplementary literature, comfortable and adequate working space, are only a few of the physical things that accompany a good program. While transportation facilities help, they are frequently accepted as a substitute for good leadership. Camps that boast expensive cement tennis courts, riding horses and an abundance of canoes frequently pay their Nature leaders little or nothing. The director of one such camp recently wrote, "We need a versatile counsellor in Nature who can also TAKE CHARGE of sailing, music and dancing and assist in riding". Another director, desirous of advertising his supplementary equipment in Nature, says that for $1000 he got a collection of lantern slides "covering everything that could be studied or photographed out of doors in the eastern states." While the latter of these two directors obviously believes more firmly in Nature work than the former, it is plain that neither appreciates the possibilities in this field. Lantern slides in a summer camp might be the result of a good summer's experience, but they would hardly be the means of making the summer what it might be. Campers might well be taught how to make their own slides and take a set home with them at the end of the session, but to think that any set of slides can equal the benefits of first-hand experience available in camp shows some lack of vision.

A survey just completed of ninety summer camps shows, strangely enough, that less than half of these use their camp sites as a game refuge so that living things may be available for study during the camp season. More than half of the camps permit shooting on their grounds, and a considerable number rent the shooting rights during the non-camping season. Only about one-third of them offered anything on conservation in their regular program, and only about one-quarter maintained Nature trails as teaching devices. A surprisingly large number have no Nature counsellors at all. One director wrote that "as this is a camp for retarded children, we do not carry on Nature study." We could not help but wonder if a possible reason for retardation of these children might not be an unnatural, pedantic, formalized education in which only an unnatural child might make an "unretarded" record. As we read this sentence, visions of groups of backward classes and individuals who blossomed into life with work in Nature study came to mind.

In the survey, Nature study ranked between fourth and fifth place among athletics, health, woodcraft, handicraft, music, fine arts and conservation. A surprisingly large number, for example, considered music as more worthy of emphasis in camp than was Nature work. One director wrote that until she received our inquiry she had never thought of using her camp program for Nature instruction.

The Summer Sessions. The opportunities for leadership training in summer continue to be great and varied. A mimeographed directory of the more important of these schools in America and abroad will be sent through Cornell University, to those addressing this department.

Apparently the same types of schools will be found to be open this year as in past summers. Those desiring to live in hotels and get their Nature work in this sort of setting, free from the necessity of making their own beds and meals, will find their opportunity for this on the west coast through Prof. Peterson's courses sponsored at San Jose, California. In the east, Dr. Craig's course, sponsored by Columbia, will serve a similar function but on a somewhat different philosophy. Less de luxe service with a more informal set-up may be found at the Audubon Society's camp in Maine, at Dr. Vinal's school at Amherst, Massachusetts, at the Allegheny School of Natural History, sponsored in part by the New York State Museum, and in Prof. Green's always popular camp at State College, Pennsylvania. At Cornell University, at Ithaca, New York, the editor of this column will again offer the course in teaching natural history in the field in which the students will live in sleeping bags and on a cruiser and work under the leadership of field naturalists in geology, botany, zoology and ecology.

To the writer's knowledge there are no European tours planned primarily for teachers of natural history this summer, although there are a number of excellent stations where satisfactory work may be done and on which information will be supplied to those interested. The same holds for road courses offered in this country. The Office of Education in Washington, D. C., is soon to publish a directory of institutions known to offer courses in the field of conservation and suitable for teachers in training and in service. This will be supplemented by publication by the American Nature Association of the results of personal investigations of a few of the schools believed to be making outstanding contributions in this field. Further investigations of training centers during the summer sessions will be made this summer by a fellow of the American Nature Association who will give particular consideration to centers and schools for training youth and adults in rural areas in natural history problems. In some parts of the country there seems to be a belief that itinerant faculties serving a number of schools, with specialists recruited from university faculties, and with professional naturalists with other connections, may solve the problem of getting a suitable staff for this new and most comprehensive field. In this connection the Biological Survey has given effective cooperation in some cases. In other instances it has been difficult to recruit these faculties without giving unwanted recognition to representatives of groups with selfish interests.

An interesting training center for youth along conservation lines is under consideration at the Moosehorn Game Refuge at Calais, Maine, on a cooperative basis between the National Youth Administration and the Biological Survey. Should this project succeed and be imitated elsewhere it might have a far-reaching influence in conservation education fields.

Some Fishing Studies. The insert in the center of this magazine should be variously useful in summer Nature activities. We find plenty of people enthusing over the recognition of different kinds of birds, trees and wild flowers. We have bug collectors and rock collectors, but most people interested in fishes seek only the game species, or the bait minnows that may enable them to catch game fishes. This must be because few people have taken the time to watch our native fishes and to try to learn of their habits. We have splendid field books on birds, but none on fishes. We have bird clubs and wild flower societies that make relatively serious studies, but those who study fishes are considered just a bit peculiar.

The writer ventures to say that almost any American locality where there is fresh water in streams or ponds will boast fishes whose beauty rivals that of any bird and whose behavior is just as interesting. The iridescent coloring to be found on common shiners, the brilliant colors on trout and red-sided minnows, the burnished color of a golden minnow, are all worth seeing to anyone with esthetic instincts.

As to habits, almost anyone who can enthuse over the parental care shown by a bird will get equal pleasure in studying a sunfish, bass, stickleback, catfish or lamprey. Even the common goldfish, which lacks these parental instincts, is worth watching in its courtship behavior. Literature regarding breeding habits of the common tropical aquarium fishes is becoming abundant, but that about the native species is scattered widely in different scientific journals. Surely here is a real opportunity for a richer literature of popular appeal, and summer provides a superior season for making new discoveries.

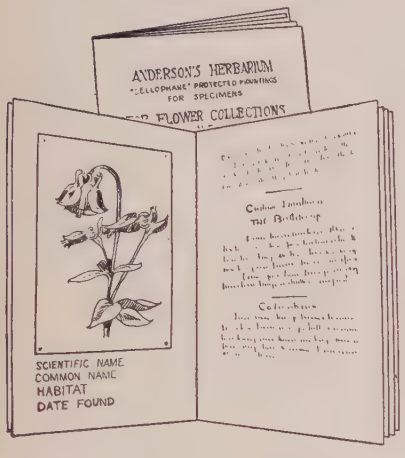
To study fishes in their natural habitat one may make a glass-bottomed box with an opening above for observation with the reflecting light shut out. Such a box placed over the side of an idly drifting or anchored boat will produce some surprising discoveries in a clear-watered pond or stream. It will also be helpful to those who wish to wade in swifter water since it is almost impossible to observe what takes place under a ruffled water-surface.

Diving bells have been made by many youngsters in eastern high schools and have led to some surprising experiences with fish. Nets, of course, are useful, but are naturally forbidden to be used in waters inhabited by certain game species. A seine drawn in a weed-glutted shallow pond may yield more sticklebacks and minnows than one can readily identify or study. It will be found that a seine may yield a bigger haul if the water is

Ride Your Hobby!

Preserve your specimens of rare and wild flowers. Make your trips into the woods and fields of lasting interest and educational value.

Anderson's Herbarium
Will solve your problem



These herbariums are designed for the protection of flowers, leaves, and other plant parts by placing the specimens under Cellophane. Excellent for TEACHERS, STUDENTS, CAMPERS, HIKERS and nature lovers in general. Successfully used in summer camps, boys and girls organizations and nature clubs.

THREE SIZES

"Camp Special", 5½″ x 8¼″ in bound form, contains twenty pages on which one side of each page is designed for holding specimens. The other sides of the pages have helpful information on collecting, identifying, structure, function, and description of poisonous plants, 25c each. Loose leaf, 7″ x 9″, Herbarium, 20 pages, 35c each. Loose leaf, 9″ x 12″, Herbarium, 25 pages, 50c each.

Educational. Teaches preservation of rare flowers; identification; flower structures and functions. Arouses interest in collecting and serves as a memory book of the past.

Send your order today

AMERICAN NATURE ASSOCIATION
1214 16th St., N.W., Washington, D. C.

Mail me postpaid the following Herbariums for which (check, P. O. Money Order) for $..... in full payment is enclosed.

..... **copies of Camp Special @ 25¢ Each**
.....**copies of 7″ x 9″ Herbarium @ 35¢ Each**
... **copies of 9″ x 12″ Herbarium @ 50¢ Each**

Name .....

Address .....

roiled than if it is clear. If one is too lazy to draw a seine, cheap minnow traps may be made or purchased, and will yield more than enough to keep one busy. The only reason one might suggest that traps and seines might not be used is that they usually result in killing interesting fishes unnecessarily. A fish in the hand, however, may be necessary for the initial identification by the novice.

Here is a field of Nature study that could well be tied in with the swimming period in summer camps, but which is usually not considered at all. A new series of ten-cent books on fresh-water fishes may be helpful if used in connection with the insert in this magazine, and with the standard scientific texts on the subject.

A REAL WILDERNESS

(Continued from page 344)

rank and file of park visitors.

Another advantage of the network of alluring trails built in the Great Smokies by the National Park Service is that these new trails lead to many beauty spots that we never knew in the pre-park days. Many of the old trails passed within short distances of—but not in sight of—things of real character and distinction.

Some of the finest hardwood forest patriarchs, now seen along new trails, were just out of sight of the poorly-routed old trails.

Ramsey Falls, the park's most beautiful water display, was within a few hundred yards of the old trail through the Greenbrier wilderness area to Mt. Guyot, but was unknown until a few years ago. The new trail crosses the rapidly cascading stream immediately below the falls.

Charlies Bunion, one of the most spectacular spots in the park, came into prominence only after the National Park Service built the new trail around the sheer side of the peak, whereas the old trail had followed the more prosaic route over the crest.

Many other similar examples could be cited by anyone who has seen much of the Great Smokies both before and after the park's establishment.

I have known the Great Smokies for many years, and during the past fifteen years have hiked intensively throughout the area—using old trails, new trails and untrailed routes. It is my conviction, based upon personal observation and upon the comments of many others, that the National Park Service has followed a sane policy in the development of the trails and roads. I know that these better approaches are serving to protect the mountains, and that the Great Smokies now have more of a primeval wilderness aspect than they did in private ownership.

The rugged mountains were beautiful and impressive then. They are doubly so now.

And, being more easily accessible, it is possible for great numbers of nature-hungry people to come and drink of the primitive beauty without damaging the source of their inspiration.

TROPICAL FISH

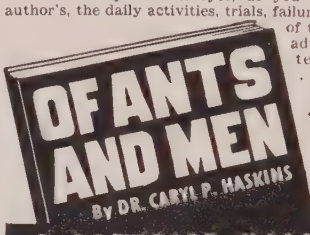
You can have a small section of the South Seas right in your home . . . richly colored tropical fish . . . exotic in shape . . . swiftly darting among the undersea foliage. Complete instructions for starting an aquarium are in our BIG FREE CATALOG.

Eastern Gardens, Dept. N!
Kissena Blvd. & Rose Ave., Flushing, N. Y.

Here is a book that will open before you a world of undreamed wonders. Study the ant's astounding organizations and you will marvel at the uncanny parallels between its social systems and those of man . . . at the workings of its democratic, fascist, communistic and slave states. You will meet such intriguing personalities of the ant colony as queens, cows, pets, warriors, policemen, slaves and thieves. You will see ingenious adaptations to environment. Your imagination will be gripped by the cleverness with which the ant solves its political, economic and social problems.

• • OF ANTS AND MEN

by DR. CARYL P. HASKINS, will tempt you to build your own glass nest (a few minutes' chore), or study the drama of ant life in the nearest field or garden. Having read the book, you will find in actual "field study" your key to the most rewarding, intriguing, educational hobby that ever brightened your leisure moments. You will witness with your own eyes, as you do through the author's, the daily activities, trials, failures and triumphs of the world's most advanced and systematic creature . . the ant.



SELECTED BY THE SCIENTIFIC BOOK CLUB

$2.75

Prentice-Hall, Inc. 70-5th Ave., N.Y.

A PRENTICE-HALL BOOK

PRENTICE-HALL, Inc.
Dept. OD-2, 70 Fifth Avenue, N. Y. C.
Please send me "Of Ants And Men." I will pay the postman $2.75, plus few cents postage. If, after 5 days' examination, I decide not to keep this book, I will return it for a full refund.

Name .....
Address .....
City..... State.....

☐ Check here if you prefer enclosing check or money order, in which case publishers pay the postage. Same refund privilege applies.

Make This Your Hobby

Know something about rocks, minerals, ores, gem stones and crystals, their occurrences and where found. Intensely fascinating. Join the Rocks and Minerals Association and let the world's largest mineralogical society (membership world wide) open up for you a new field of nature's mysteries, adventure and travel. Membership offers many advantages including **Rocks and Minerals**, a monthly magazine. Enroll today by sending the dues ($2.00 a year) to

The Secretary, Rocks and Minerals Association
Dept. N **Peekskill, N. Y.**

New Books for Nature Lovers

What Snake Is That?

By Roger Conant and William Bridges. A simplified field reference book that will enable anyone to quickly identify any snake of the United States east of the Rocky Mountains. Completely illustrated by Edmund Malnate. $2.00

What Shell Is That?

By Percy A. Morris. An extremely practical handbook guide to the shell-bearing mollusks of Eastern North America. "Unique, handy . . . fills a long-felt need."—*N. Y. Herald Tribune.* Completely illustrated. $2.25

AT ALL BOOKSELLERS

D. APPLETON-CENTURY COMPANY
35 West 32nd Street, New York

(A) 18x22. Ruffed Grouse

(B) 18x22. Mallard Duck

(C) 18x22. Wild Turkey

(D) 18x22. Snowy Heron

For the first time

in Audubon History

AUDUBON CRAFT PRINTS

at a popular price

$1.95 each POSTPAID IN U. S. A.

Four Outstanding Subjects

(A) Ruffed Grouse
(B) Mallard Duck
(C) Wild Turkey
(D) Snowy Heron

These four outstanding paintings of the great Audubon have been perfectly imprinted, in full color, on the finest artcraft stock, size 18 x 22 inches, with plate-sunk mat border. Print connoisseurs the country over have acclaimed the quality and craftsmanship of these exquisite prints. They are ready for framing and represent an outstanding value at $1.95 a picture.

Because of the tremendous expense involved in their production, the above four subjects are the only ones available at this time. Additional subjects will be added periodically, so that at a nominal cost every one may become a collector of these famous paintings.

These subjects will delight every nature-lover and sportsman, either for his home, club or office. Particularly suited for schools, libraries and recreation rooms.

MAILED POSTPAID

Send Your Order Today

American Nature Association
1214 16th St., N. W., Washington, D. C.

Please send me postpaid the Audubon Prints checked. My (check, P. O. Money order) for ..... in full payment is enclosed. (A ☐) (B ☐) (C ☐) (D ☐)

Name .....

Address.....

YEARS AND YEARS

(Continued from page 308)

to a height of two hundred and seventy-nine feet; its basal circumference is one hundred and two feet and its greatest diameter thirty-six feet, five inches! And, coupled with these figures, we must add the fact that, it has been conservatively estimated to be *three thousand, five hundred years old!*

Measured by this standard, all other life spans fade into utter insignificance. Imagine a thing now living that began its existence in the year 1566 *B. C.* When Moses was a baby in his cradle-boat among the bulrushes of the Nile, this tree was over a hundred years old; when Rome was founded and Micah was forecasting the coming of Christ, more than seven hundred years before the event, it was over eight hundred years old. When Alexander the Great died (at the age of thirty) the tree had passed its twelve hundredth birthday and when Christ was born in Bethlehem of Judea, it was fifteen hundred years of age. Twenty-four hundred birthdays had passed over its ever growing crown when the First Crusade began and such recent happenings as the discovery of America have occurred since its three thousandth anniversary. Still it lives, and may continue to do so for another two thousand years!

The sequoias, or famous "big trees" of which this remarkable specimen is a representative, grow at altitudes of from five to eight thousand feet on the western slopes of the Sierra Nevadas in California. Together with their huge cousins, the coast redwoods, representative groves have been forever set apart by the Government as units in our national park system, never to feel the woodsman's axe.

Strangely enough, these far western trees are named for an eastern Indian, Sequoyah, that brilliant leader of the Cherokees. His claim to fame lies in his invention of an alphabet that enabled even the children of that once mighty tribe to read and write. He wandered to the West and spent the latter part of his life far from the home of his forefathers.

The measurements of some of these ancient growths in terms of historical happenings give, perhaps, the most vivid idea of their age. In the halls of the American Museum of Natural History, in New York City, is a gigantic exhibit, embracing a cross-section of a sequoia, its various stages of growth marked from the heart outward to the bark, and the intervals illustrated by contemporaneous occurrences in the world's history. This tree was known, when living in Fresno County, California, as the "Mark Twain Tree," and, when felled in 1891, had reached an age of 1341 years!

As a seedling, it pushed above the ground in the year 550 A. D., a period being marked by the decline of the Roman Empire. Fifteen years later, when it was a sapling, Mahomet was born. In its third century of life Alfred the Great ascended the throne, and about the same time, the hardy Norsemen were nearing the deceptive coastline of that new shore to which they gave the name of Greenland. The tree was already big then, being between six and seven feet in diameter, but was only a child in years! During the struggles of the thirteen colonies, and the other events of the making of America, it finally attained a respectable maturity, until, in the closing years of the nineteenth century, man's axe brought it crashing downward.

Part of it now gives enjoyment and wonder to millions of people annually, and as small as this cross-section is, in comparison to the entire trunk, its twelve pieces, put together in their present form, tip the scales at nine tons.

It gives one pause to consider the power of man over the works of nature. Here was a mighty monarch of over 1300 years' growth, a towering monument of nature's handiwork which, in a few minutes comparatively, was brought low by puny beings, ant-like, but invested with a domination which makes them the lords of creation. It is the misuse of this power over wild-life which has made man the greatest enemy of nature and, on the other hand, its proper use may make him its most potent protector. Having all but wiped out the oldest and largest of living things, man suddenly turns about and, led by a few far-seeing and thoughtful individuals, now seeks to protect the remnant from all further damage!

How much easier it is to save than to replace. It is no difficult matter to kill an animal or bird, or to cut a tree, but how different replacement! One thoughtless act of a few minutes can undo the work of nature that took years to accomplish.

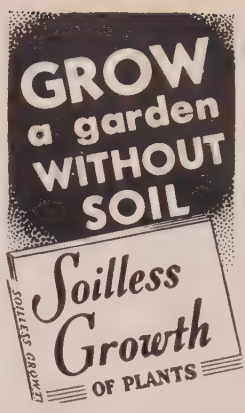
And so, to many of her children, Nature has given generous spans of life. It is something that should give us pause if we would take time to think about it; it is an added interest to the animate and inanimate wonders which are all about us. Some of these wonders have lived during other civilizations than ours, and may well outlive this rush and hurry of the machine age that we have reached. Who can tell?

Plants without Soil

Growing plants without soil has in it the element of botanical adventure, and it is a field that has become increasingly popular with the experimenting agriculturist and with laymen. We have received many requests for suggestion of popular texts on this subject but the list is a meager one. We can, without hesitation, however, recommend *Soilless Growth of Plants* by Carleton Ellis and Miller W. Swaney. Covering the use of nutrient solutions, water, sand, cinders and other methods of culture, this book discusses the subject in a simple way. It presents information on what has become accomplished and learned in this field, and points the way for further experimentation. Its authors have been workers in horticulture for many years—inquiring workers who, in presenting this book, also solicit report of results obtained by readers who try their hand in growing without soil. Published by the Reinhold Publishing Corporation, New York City, this book has already proved its need and will continue to do so. It is priced at $2.75.

Education Week

The theme of American Education Week this year will be "Education for the American Way of Life". November 5 to 11 have been set aside for the observance, and it is none too soon to start thinking about it. In fact, the theme of the week is one that should be before the American people three hundred and sixty-five days a year and an extra day on leap year. With the world as it is now we should never lose sight of the significance of the "American Way of Life".



A packet of seeds, the simplest equipment, a few cents' worth of harmless chemicals — and you're off on the fascinating new hobby of "making things grow" *without soil.* Flowers, vegetables and fruits spring up as if by magic out of cinders, sand or water. With little care, no fuss and with infinite rewards of beauty and surprise, your soilless wonderland can be the most intriguing adventure you ever found in a hobby. SOILLESS GROWTH OF PLANTS, by Ellis and Swaney, is the only book to explain the principles and give you the easy step-by-step directions. See a copy at your bookstore or department store today. Or, on our 5-day money back offer, send $2.75 to: REINHOLD PUBLISHING CORP., Dept. N-1, 330 W. 42nd St., N.Y.C.

● Your own garden is more important to you than any garden of history. But, there is no pleasure in seeing insect pests destroy what you and nature have spent weeks in developing.

A SAFE—EFFECTIVE SPRAY

To guard against damage from many insects, spray with "Black Leaf 40" regularly. This famous insecticide kills both by contact and by fumes. A little makes a lot of spray. Directions on label and leaflets describe its many uses and how to obtain maximum effectiveness. Sold by dealers everywhere.

TOBACCO BY-PRODUCTS & CHEMICAL CORP., INCORPORATED
Louisville, Kentucky

Insist on factory-sealed packages for full strength.

Black Leaf 40

3905

LOOK FOR THE LEAF ON THE PACKAGE

WE
Pamper Mortals
ON VACATION AT
POCONO MANOR

Excellent golf, riding, swimming . . . indoors and outdoors filled with entertainment for everybody—that's P.M. for your summer vacation. Delightfully cool, friendly and informal. Farm-fresh food. Bring the family to the top of the Poconos for the summer.

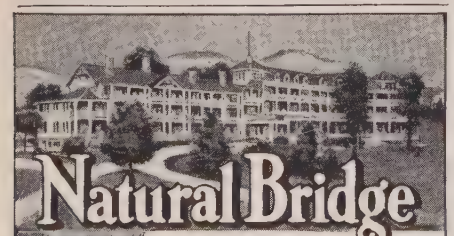
HERMAN V. YEAGER, General Manager
POCONO MANOR, PA.

IRIS from California. New introductions, rare varieties and wide color range. Thrive anywhere. Safe delivery *guaranteed.* New 1939 color catalog describes 250 varieties, free. **Milliken Iris Gardens, Dept. P, 970 New York Ave., Pasadena, California.**

Keep Your Dogs
FREE
FROM WORMS
WRITE FOR FREE BOOKLET No. 652
NEMA
WORM
CAPSULES
EFFECTIVELY REMOVE LARGE ROUNDWORMS AND HOOKWORMS IN DOGS OF ALL BREEDS AND ALL AGES. DEPENDABLE
Nema Booklet tells you about worms
Write to Animal Industry Dept., Desk N-21-G
PARKE, DAVIS & CO., DETROIT, MICH.
Drug Stores Sell Parke-Davis Products

CRESTMONT INN
EAGLES MERE, PA.
40th Season Opens June 15
Plan now for your holiday at this hospitable, beautiful Inn. Superbly situated—2200 ft. altitude, overlooking the lovely Lake of Eagles. All land and water sports; cycling and motoring over miles of scenic roads. Music, dancing, bridge. Attractive appointments . . . a **cuisine** that's famous . . . congenial fellow-guests attract a distinguished clientele. Cottages for families—children welcomed.
May we send you an illustrated folder D and rate card?
WM. WOODS, Proprietor
CRESTMONT INN Eagles Mere, Pa.

Pocket Size
"Ferns of N. E. U. S."
$1. Only Key to sterile plants. Cloth
(From author) Farida A. Wiley, Museum of Natural History, 77th St. West N. Y. City



Natural Bridge
of Virginia
ONE OF THE SEVEN NATURAL WORLD WONDERS
Everyone
SHOULD SEE IT
COTTAGES *Double Room* $1.00 *per Person*
HOTEL $1.50 *and up*
SEND ONLY 10¢ FOR PICTURE AND BOOKLET
For ten cents we will send you a beautiful picture in four colors, size 8x10 suitable for framing, together with a 32 page booklet entitled "The Story of Natural Bridge of Virginia."
NATURAL BRIDGE OF VA., Inc. Natural Bridge, Va.
Please send me Picture and Story of Natural Bridge. I enclose 10c.
Name
Address
City State

Diana Thorne's
DOG COLUMN

THE DOG AND THE VACATION

Most of us try to have at least one vacation each year as a rest and change from business or household duties, or, simply, as a change of scene.

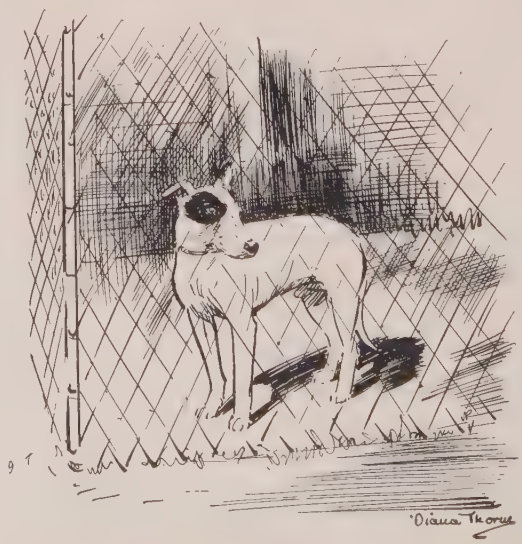
Dog-owners, then, if alive to their responsibilities, are at once confronted with the problem of exactly what to do about the dog; whether to take him along with you depends greatly on how you intend to travel and the conditions at your destination; whether you intend to keep moving or to stay where you can have your dog happily beside you.

If you are bound for your own country cottage, the matter is simple, but if you are going to hotels or a boarding-house or some other person's cottage, or to any place in another country, both you and your dog, if he goes with you, are inviting trouble. An increasing number of hotels are objecting to the presence of dogs. The hotel owner is finding that to permit one dog in its hostelry is to permit any number, and that two or three dogs meeting in a hotel lounge can provide more excitement in half an hour than possibly the entire town could offer in the course of the day.

If you plan a car-trip, long or short, and, better still, if you intend to camp on the way, your dog will be a delighted and grateful companion and useful as a guard. Be he Pekinese or German shepherd, fox-terrier or bull-terrier, he will enjoy every minute on the road with you and you will be glad to have him. He will enjoy hiking, swimming and camping with you, and generally he will be less trouble than any human companion.

If you have to leave your dog behind—for whatever reason—arrange for the proper care of him and for conditions that will alleviate, as far as possible, his unhappiness without you. A dog, remember, has only one person in his mind. Without you he is bound to be unhappy, but you can at least do your best to arrange for his comfort. If you have a friend who likes him, leave him with that friend, but be sure that your friend understands him as well as likes him. And be sure that your dog likes that friend sufficiently.

Failing such a condition, you may have to board your dog in a kennel. That's the best, probably, you can do and you will, no doubt, find your dog well enough in physical health when you return. Certainly it is better to board him in a reliable kennel than to deposit him in care of reluctant or unsympathetic hands.



However, remember that kennel life thrust on a grown dog accustomed to a house and to his master's ways, and, especially, a lengthy period in the kennels, has its effect on the dog and leaves an impression not beneficial to his mind. It will be difficult when you take your dog home again to make him understand that you did not desert him. This is particularly true of the "one-man" types such as German shepherds.

Selecting Garden Tools

It has never occurred to us to wonder how much thought the gardener gives to the selection of the tools used in his or her garden activities. We confess that we never went very deeply into the relative merits of this hoe or that hand cultivator. It appears that we have been wrong and that we should as carefully consider the instruments designed to help in making our garden a happy spot for flowers as does the golfer in picking out his woods and irons. A little booklet entitled *How to Judge and Select Garden Tools* comes to us from the Home Garden Bureau, 550 Dublin Avenue, Columbus, Ohio. You, too, may have a copy if you will write to that address.

For Junior Bird Students

Designed as an introduction to bird study, *The Junior Book of Birds* by Roger Tory Peterson is admirably designed to accomplish that purpose. Based upon the educational leaflets of the National Association of Audubon Societies, it covers twenty-three birds, describing them in simple style, the description supplemented by colored plates and drawings by the author. Published by Houghton Mifflin Company at two dollars, this book is the ideal gift to any young bird lover.

Pocket Shell Guide

If you are going to the seashore somewhere along the coast of eastern North America you will do well to take along a copy of *What Shell Is That?* by Percy A. Morris. This is a guide to the shell-bearing molluscs of our northeastern coastal section. Physically, it is produced to fit into the pocket. A page is devoted to a picture of each shell and accompanying text to aid in identification. This useful and valuable guide is published by D. Appleton-Century at $2.25.

Animal Outlaws

This is the title that Gid Graham gives to a book based upon his life-time in the outdoors. He states as the purpose of the volume: "To promote the protection of our wild life by presenting true accounts of heroic animals whose struggles for life and liberty, their loving devotion, superb morality, courage and strategy challenge the admiration and sympathy of the investigator." The author deals with those mammals that have been persecuted by man, who has often placed a price upon their heads—wolf, coyote, bear, mountain lion. He tells of specific animals encountered in his own long experience; tells of them with understanding. This book has particular value as a record of the West and what has happened to it during the seventy-one years of the author's life. Published by the author, it is available from him at Collinsville, Oklahoma, for $2.50.

About Chrysanthemums

A useful addition to specialized horticultural literature is to be found in *Hardy Chrysanthemums* by Alex Cummings, Jr., a most recent addition to the series of garden books being published by Whittlesey House. As the title suggests it treats with these popular garden flowers from their history to their breeding. This is a practical book of definite value to the gardener. It sells for $2.50.

CLASSIFIED ADVERTISING

BOOKS

BIRD & ANIMAL PAINTINGS
R. Bruce Horsfall
Beautifully printed, size 8½ x 11 inches, contains 168 pictures of Birds, Animals, and Insects, in full colors, size 2½ x 3½ inches, and an attractive frontispiece of the American Eagle. Each picture accompanied by concise description of the character and habits of the subject. Good for school, camp and home. $1.50 per copy postpaid.
AMERICAN NATURE ASSOCIATION
1214 16th St., N.W., Washington, D. C.

BOOKS ON FORESTRY

FOREST FACTS FOR SCHOOLS
336 pages, 34 illustrations, cloth bound. Book for pupils in Grades 5 to 12. Exercises and new-type tests follow each division of the text matter. 80c

FORESTS AND MANKIND
250 pages, 66 cuts and illustrations, cloth bound. Convincing knowledge of the importance of the forests in their historical, social and economic relation to mankind. $3.00

TREES AS GOOD CITIZENS
268 pages, 16 full color plates, 125 other illustrations, cloth bound. This book tells the whole story of the shade tree. $2.00

NATURE BOOK DISTRIBUTORS
1214 16th Street, Washington, D. C.

---

3 BIG, NEW, ILLUSTRATED BOOKS
(Each Volume A Foot High)
By Gayle Pickwell

WEATHER
The story of weather in vivid words and pictures; the scientific "hows" and "whys" explained without technical language. 170 pages, 69 plates including 14 explanatory diagrams. **$3.00**

BIRDS
A unique study of homes and home life, foods and feeding habits, travels, and feathers of scores of common American birds. 239 pages, 68 plates including several drawings and diagrams of special help to bird lovers. **$3.50**

DESERTS
Describes and pictures the deserts of America, their strange plant and animal life: flowers, cacti, lizards, snails, snakes, birds, horned toads, rodents, tortoises and other animals found only in the desert. 174 pages. 64 plates. Frontispiece in full color. **$3.50**

WHITTLESEY HOUSE
McGraw Hill Book Co., Inc.
330 W. 42nd St. New York

BIOLOGICAL SUPPLIES

NATURAL History Supplies. Free list. **Nature's Supply House, Platteville, Wisconsin.**

BUTTERFLIES

TROPICAL Butterflies. Entomological Supplies. List free. **Butterfly World Supply House, 297 East 98th Street, Brooklyn, New York.**

BUTTERFLIES. Attention Collectors. We specialize in rare tropical butterflies from all over the world. Send for free list. **THE BUTTERFLY MARKET, 400 S. 9th St., RICHMOND, IND.**

ACTIAS ISIS from Dutch East Indies, large, unusual shaped moth with 5-inch tails, $1.00. **Nature Room Supply House, 2781 Grand Concourse, New York, N. Y.**

CAMPS

CAMP DIRECTORS, notice the change in our address to new larger quarters. Descriptive folder free. Set of six, 3½ x 5 photos of finished units sent for 10c. See these aids to your progressive nature program.
JELINEK'S NATURE STUDY SERVICE
612 E. Clybourn Ave., Milwaukee, Wisconsin

DUDE RANCH

PATON RANCH, situated on a mountain stream in the Big Horn country of Wyoming, welcomes a limited number of congenial guests. Write **William Paton, Shell, Wyoming.**

FILMS DEVELOPED

IMMEDIATE SERVICE!—Better pictures. Sixteen guaranteed prints from roll, 25c. One colored or two Plain Enlargements and 8 guaranteed prints 25c. Sixteen reprints only 25c. SPECIAL!—Coupon for 8x10 enlargement given with every 25c worth Kodak finishing. ONE DAY SERVICE! Details and Film Mailers FREE on request.
AMERICAN STUDIOS, Dept. M, La Crosse, Wisc.

THE PHOTO MILL. IMMEDIATE SERVICE! NO DELAY! Roll developed, carefully printed and choice of two beautiful 5 x 7 professional enlargements, one tinted enlargement, or eight reprints for 25c coin. Reprints 2c each. **THE PHOTO MILL, Box 629-53, Minneapolis, Minnesota.**

INDIAN CURIOS

100 Good ancient arrowheads $3.00; Tomahawk head 50c. Flint knife 25c. Illustrated catalog 5c.
H. Daniel, Hot Springs, Arkansas

INDIAN Relics, beadwork, coins, minerals, books, curios, weapons, dolls, old glass. Catalog 5c. **Indian Museum, Northbranch, Kansas.**

MINERALS

MINERAL SPECIMENS and books on mineralogy, gem polishing, fossils, meteorites, etc. Catalog .05. **The Gem Shop, Box E 797, Helena, Montana.**

BIG MAIL: GEM, MINERAL, OTHER HOBBY OFFERS, with sample copy "GEM, MINERAL TRADER". Free. **NAT McCAMPBELL, Calexico, Calif.**

SCIENTIFIC

TELESCOPES, Microscopes, Binoculars: 1939 bargain catalog free. **Brownscope Co., 5 West 27th Street, New York.**

SEA SHELLS

SCIENTIFICALLY labelled shells—forty different California $1.00, one hundred $3.00, 25 Cuban $1.00, thirty fossils $1.00. Free catalogue. **SEA SHELL HOUSE, 1611 Elena, Redondo Beach, California.**

TAXIDERMY

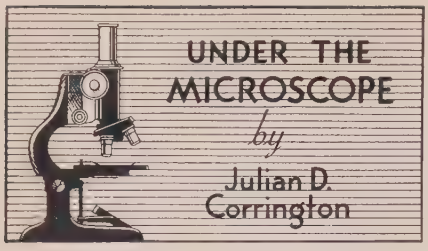
TAXIDERMY SUPPLIES—QUALITY Artificial Eyes, Teeth, genuine Jonas head forms. Tools, materials, etc. Everything for the progressive taxidermist. Send 10c for big illustrated catalog. **Jonas Bros., 1023 Broadway, Denver, Colorado.**

TRAVEL

OUTDOOR enthusiast wants male companion climbing high peaks during summer. **Fred Braun, Indian Hills, Colorado.**

WILD FLOWERS

IN COLORS—60 post cards, 25c doz.; 64 2 x 3 in. stickers 55c; book of 365, $3.95; 50 lantern slides & lecture rented 1 day $3.75 & postage. Books, slides or photos (7000), movie films. Membership & magazine $1.50 a year; Junior Chapters of 25 or more 10c per member. **Wild Flower Preservation Society, 3740 Oliver St., Washington, D. C.**



Planaria

Dwelling on the bottoms of clear, freshwater springs, pools and streams, and hiding under logs and stones are the planarias, of a number of different species—small, flat, blackish worms of great interest to biologist and microscopist. They are members of the Phylum Platyhelminthes, or Flatworms, of which they constitute one of the three principal Classes (the Turbellaria), the other two being the flukes and tapeworms, well-known internal parasites.

Planarians may be collected by turning over flat stones under water and examining the bottom surfaces for elongate gray to black objects averaging about one-half inch in length. They are very thin and flat and cling so tenaciously that a knife blade or fingernail is necessary to pry them loose. A better and more amusing way of collecting quantities of these worms is to go fishing for them. A small piece of raw meat is fastened to one end of a length of string and lowered into the selected body of water for a few hours. If planarias are at all abundant the meat will be found covered with dozens to hundreds of these worms when pulled up for inspection; if not, try another location.

Captives are placed in one or more bottles of their native water for transportation back to the home or laboratory and are then kept in shallow vessels, such as Petri dishes, fingerbowls, or (best) white enamel photographic developing trays or milk pans, which are then covered to darken the interior and stored in a cool place. Use the natural water in which the animals were caught, or spring or well water. Most city tap waters are unsuitable chemically.

To maintain a culture of these interesting household pets, feed twice a week by placing one or more long thin strips of fresh beef liver in the vessel, then, after three hours, remove the liver, rinse the pan well and refill with fresh water. At feeding time, watch for protrusion of the muscular pharynx, shown as the clear, central tube in our illustrations. The mouth is located mid-ventrally and the pharynx is sent out through this opening to seize food. Planaria belongs to the triclad order of its class, meaning that the digestive system has three main branches, one anterior and two posterior, at either side of the pharynx. Each of these main trunks has numerous side divisions, food being transported directly to all parts of the body.

Planarians have a pair of eyes that are light-perceiving but not image-forming, and in rear of these on the sides of the head, a pair of sensory lobes, which are especially adapted to detect currents in the water and the presence of food. They move in a slow gliding fashion by means of microscopic cilia covering the ventral surface and also by muscular contractions and twistings. Experiments testing their behavior are easy and interesting and it will be found that they move away from a light source and toward a current, as the squirting of a pipette toward one side of the head region, and toward dissolved juices given off by the beef liver at feeding time, or a drop of bouillon from a pipette.

Great interest attaches to these worms for the student of general or experimental zoology. They are the first (lowest) animals to possess bilateral or two-sided symmetry, characteristic of all higher types, including man; this in turn brings with it an elongation so that there is an anterior and posterior end, a dorsal or back surface and a ventral or belly one, and right and left sides. Again, this plan of organization entails the specialization of one end that always precedes in locomotion and becomes the seat of concentration of nervous tissue and sense organs to test out the environment—in other words, the formation of a head, so vitally important in the scheme of living of higher animals. Flatworms are also the first animals to acquire a mesoderm, a layer of cells between outer and inner surfaces, and from which arise skeletal, muscular, excretory, reproductive and other systems of organs.

Hydra, by contrast, has radial symmetry, no head and no mesoderm. Both Hydra and Planaria have been extensively used in experimental work involving regeneration of lost parts and grafting one part upon another in order to understand the physiology of animal organization. We recommend that you try some of these experiments yourself. For example, cut a specimen in two crosswise with a sharp scalpel or safety-razor blade and watch each piece regenerate (reform) the lost half over a period of time so that eventually your experiment terminates with two complete planarias thus artificially reproduced from the one with which you started. Then try cutting one into four or five pieces and study the results; or slit the head lengthwise for about one-quarter the length of the animal and renew this cut occasionally, as often as necessary to prevent the severed surfaces from adhering and growing back together. If successful, this will make a two-headed planaria, which should then be photographed. Some investigators have in this manner secured a single specimen with as many as ten heads. A fine illustrated discussion of procedures and methods for this work, with many other suggested experiments, will be found in Buchsbaum's *Animals Without Backbones*, reviewed in the March issue.

Advanced Hints

To make a permanent slide of Planaria, allow a specimen to expand fully in one or a very few drops of water on a slide or in a Syracuse watch glass, then flood it quickly with corrosive acetic (formula, June-July, 1938). Keep adding more of the fixer until the worm is well covered, and allow to stand one hour, then pour off fixer and wash for an hour in several changes of 50% alcohol to which enough tincture of iodine has been added to impart a wine-red color. Stain for twenty-four hours in Delafield's hæmatoxylin diluted one-half with water, wash well in several changes of water, then give fifteen minutes each in 35 and 50% alcohols.

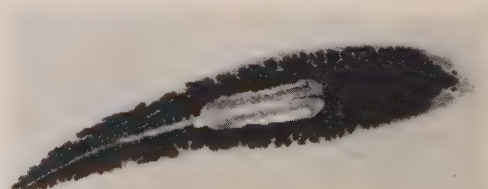
Next decolorize in acid alcohol for about thirty minutes or until the color ceases to come away freely, wash in fresh 70% alcohol, and place the specimen between two slides secured at each end with a rubber band so as to compress and flatten, and immerse this double slide in 95% alcohol for twenty-four hours. Finally, allow one hour each in absolute alcohol and xylol, or in carbol-xylol and pure xylol, according to the technique you prefer, and mount in balsam. An alternative stain used by many workers is borax carmine (formula, Nov. 1938, incorrectly titled Greenacher's Dilute Hæmatoxylin instead of Greenacher's Borax Carmine). Cross sections, such as the one here illustrated, may be cut in a well microtome (Feb. 1939, issue) and should include three regions: ahead of, through and behind the pharynx.

To prepare permanent mounts of desmids, concentrate and fix the material collected, either as a pure or a mixed culture, by straining quantities of water through muslin, then adding this catch to a small bottle of formol-acetic alcohol (March issue). The concentration should be such that a single drop from a pipette will yield an abundance of material on a slide, yet not so thick that individual plants will clump upon one another in indistinguishable masses—they should spread out well and show numerous perfect examples on each slide.

Fix for six to 12 hours, then wash in water for an equal length of time. This may be done by carefully decanting the fixer from the vial after the specimens have settled to the bottom, then filling with water, repeating the process three or four times by changing the water; or one may cover the mouth of the bottle with muslin and through a small central hole introduce the tip of a pipette, connected by rubber hose to a faucet, and allow a very gentle, almost drop-by-drop flow, a method generally referred to as washing in running water, and much preferable to mere changes of water.

After completion of washing, stain by the iron hæmatoxylin method, given below. A counterstain may or may not be employed, as desired. If any counterstain is used, one percent solutions of either eosin, orange G, or fast green are excellent, but should be applied lightly to impart a sort of background wash or tint, avoiding intense staining.

ABOVE, CROSS SECTION OF PLANARIA CUT THROUGH THE PHARYNX. LEFT, WHOLE MOUNT OF STAINED SLIDE OF PLANARIA. RIGHT, THE DIGESTIVE SYSTEM INJECTED WITH INDIA INK



Another fixer which has been widely used with many algae, including desmids, is a weak solution of potassium iodide, similar to that used in making tests for starch, but weaker, so that a light brown color results. Fix for twelve to 24 hours, wash in water and stain with any reagent desired, iron hæmatoxylin without a counterstain recommended.

THE MICROSCOPE MAKERS

(Continued from May)

John J. Bausch, founder of the Bausch and Lomb Optical Company, always had a consuming desire to increase his knowledge of optics and to make beautiful precision instruments, but in his hard struggle to hack out a living he was compelled to concentrate on spectacle lenses and frames. His ambitions were, however, transmitted to his sons, Edward, William and Henry, and the boys grew up in the surroundings of an optical workshop and absorbed their father's aims and technique.

Edward, the eldest son, early showed an inventive turn that was destined to bring him to the forefront in this largest American optical firm and to convert it from a spectacle company to a huge establishment manufacturing more than three thousand different kinds of scientific instruments. He began by making a microscope at the age of fourteen, entered Cornell University in 1871, and produced the first official Bausch and Lomb microscope in 1872 while still a student. After graduation he and his brother William set to work enthusiastically on microscopes for the Bausch & Lomb exhibit at the Philadelphia Centennial Exposition in 1876, and were highly gratified to receive awards. In charge of the displays, Edward remained in Philadelphia for three months, meeting scientists and inventors from all over the world, examining foreign instruments and observing especially the various kinds of automatic and power machinery.

Returning to Rochester, new microscopes were designed and then Edward visited the principal colleges of the United States, inviting laboratory tests of his products and meeting with an excellent reception. From 1883 onward a series of patents attested his industry in designing scientific instruments, including microscopes and parts, illuminants, a microtome, and camera shutter and lenses. Then came a trip to Europe in 1888 and a meeting with practically all of the European manufacturers of optical equipment, followed two years later by another trip, during which he spent many months at Jena with Ernst Abbe.

Perhaps his greatest achievement was the invention of automatic and power-driven machinery for lens grinding and the adaptation of other mechanisms to the turning out of precision parts in quantity. Through his work the microscope passed from the craft era of hand manufacture and assembly to that of modern quantity production without sacrifice of quality, thus greatly lowering the cost and making the microscope available to every college and high school laboratory, hospital and industrial research division. A portrait of Edward Bausch appeared in the rotogravure feature on the history of the microscope in our February, 1939, issue.

William Bausch played an important part in these developments and later turned his chief attention to the making of optical glass, beginning with experiments in 1912, when it was obvious that America could not rely indefinitely upon European sources for this highly specialized form of purest glass. In Germany this production was in the hands of a single firm under government control; in France it was a federal monopoly; literature was scanty and the process essentially a secret one; hence the work of William Bausch and his associates was a most difficult one. In spite of a series of failures, including the destruction of one plant by fire, he persevered and by 1917 had succeeded in making certain types dependably. As a result, the National Research Council, during war years when optical instruments were badly needed by the Army and Navy, sent a staff of silicate experts to Rochester to work with Bausch, and increased the capacity of 2000 pounds per month to 40,000 pounds, and soon this plant was producing large amounts of optical glass of the finest quality. During the war Bausch & Lomb turned out more than seventy percent of the government's requirements in

WILLIAM BAUSCH

rangefinders, binoculars, telescopes, gun sights, searchlight reflectors and periscopes, and today the inspection office of both Army and Navy for the Rochester district is located in this factory, in which some ten million dollars is expended annually by the government.

Henry Lomb, original partner of John J. Bausch, is described as a self-effacing individual who early interested himself in various philanthropies and community enterprises, founding the celebrated Mechanics Institute of Rochester, a work continued by Carl Lomb, his cousin, who married Caroline, daughter of John J. and Matilda Bausch, and became Vice-President of Bausch & Lomb, and who passed away only this present year, on January 26. The two families gave the magnificent new Physics Building at the University of Rochester, including the Institute of Applied Optics, and have been generous in support of every form of cultural and civic enterprise.

At one time, in connection with their microscope business, the firm had to include and carry a huge line of glassware, chemicals, biological stains and other items essential to microscopy, but the continued growth of the

MIRAKEL DAYLUX BINOCULAR

POCKET PRISM NATURE GLASSES

New and Used Field-glasses, Telescopes, Microscopes; all Makes, types and sizes, to fit all pocketbooks. Glasses exchanged: repair work guaranteed. Catalogue free.

J. Alden Loring Box K-2 Owego, N.Y.

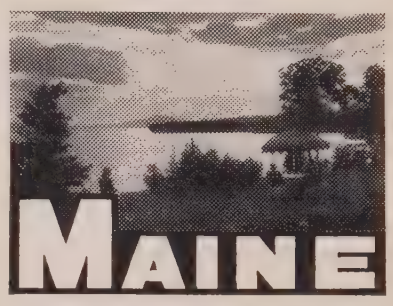
BOWS·ARROWS·MATERIALS·

HANDBOOK—How to Make and Use Bows and Arrows—90 Pages well illustrated (with catalog) 35c.

CATALOG—100 pictures—color spread—Instruction Folder. 10c.

CATALOG alone 5c. Stamps or Coin.

L·E·STEMMLER·QUEENS VILLAGE·N·Y·



One of America's most beautiful lakes at your door, a private estate for your recreation and pleasure, comfort, food and service unsurpassed—here is Maine at its thrilling best! Grand golf (no charge to weekly guests), bathing and all water sports. Riding, tennis, full entertainment program. Booklet and rates from Charles B. Day, Managing Director, N. Y. office: Hotel Croydon. BU. 8-4000.

RANGELEY LAKE HOTEL & COTTAGES
RANGELEY LAKES MAINE

THE CHALLENGE OF LEISURE

By Arthur Newton Pack
President
American Nature Association

Price $2.00

The New York *Times* says: "It is the most profoundly observing and keenly thought-out book on the subject of the significance and possibilities of the promised leisure that has yet appeared. *It deserves wide reading.*"

Order from
AMERICAN NATURE ASSOCIATION
1214 16th Street, N.W., Washington, D. C.

MUSEUM TAXIDERMY

Learn this fascinating ART under PERSONAL Direction of a Professional Museum Staff Taxidermist in one of the Worlds Largest Museums.

Five Complete Books
BIRDS··MAMMALS··GAME HEADS & RUGS
FISH & REPTILES··TANNING
Write for FREE Sample Lesson
CHICAGO SCHOOL of TAXIDERMY
P. O. Box 343, Dept. 7, Chicago, Ill.

optical industry caused them to dispose of this end of the business to the Will Corporation in 1919. A complete listing of all the products of Bausch and Lomb would fill several pages, and we can only close this brief summary of the company and its chief personalities by mentioning a few typical cases.

About one-quarter of the nation's camera lenses, more than half of the motion picture projection lenses, and all of the optical mechanism for talking motion pictures come from this plant on the banks of the Genesee River, while their balopticons are to be found in schools and colleges throughout the land. Railway signal devices; spectrometers for analyzing organic materials, rocks, ores and minerals; colorimeters, which reveal the amount of a substance present in a solution by comparing its color with one of known concentration; refractometers for determining the refractive index of a transparent substance; metallographic outfits for studying the size, shape and grain structure of metals; all are standard items.

In addition, however, B & L is often called upon to make single complicated instruments for highly specialized uses, and cooperate by undertaking researches and manufacturing processes to aid science without hope of financial reward. Such has been the case with the centrifuge microscope, which keeps microorganisms under observation while subjected to the tremendous centrifugal force of 20,000 revolutions per minute; instruments for Admiral Byrd's South Polar Expeditions, William Beebe's deep-sea bathysphere, the Fordney-Settle record-breaking balloon flight, Captain Albert Stevens' U. S. Army Air Corps-National Geographic Society stratosphere flights, and many others.

Bausch and Lomb is indeed a national institution and one of the most interesting establishments in the United States. Do not fail to visit this plant when you are in Rochester.

Trade Notes

The General Biological Supply House, Inc., 761-763 East 69th Place, Chicago, Ill., is one of the largest and most important of American firms dealing in every sort of equipment item for the study or teaching of biology. Included among their products are living and preserved plants and animals, cultures, skeletons and display preparations, microscope slides, lantern slides, models, charts, collecting equipment, apparatus, glassware and the like. In addition they publish a large amount of literature of great interest and value to the teacher, one line of which is entirely informational in character and entitled *Turtox Service Leaflets*. Many of these would be highly useful to the amateur microscopist and we have arranged to distribute the more important numbers from time to time to those of our readers who will send in a request to Dr. Corrington with a three-cent stamp for mailing costs. This month we have for you Leaflets number 4, 10 and 23, all three to be sent as one mailing. Their titles are: The Care of Protozoan Cultures in the Laboratory; The School Terrarium; Feeding Aquarium and Terrarium Animals. Those readers who maintain cultures or living animals will find these Turtox Leaflets very valuable. Others will be offered later.

* * *

For those interested in the microscope itself we have another excellent book to recommend this month, *Practical Microscopy*, by Martin and Johnson. This is a small and inexpensive volume crammed with useful information. The 116 pages and 88 illustrations cover such subjects as magnification, interpretation of image, kinds of microscopes and their various parts, bright-field, darkfield, polarized and ultra-violet illumination, photomicrography, and metallography. The approach is technological and not biological, while the style is interesting and readable. Chemical Pub. Co. of N. Y., Inc., 148 Lafayette St., New York City. $1.50.

***

Microfan Tom A. Allan, Toronto, Canada, contributes the following note on a homemade well slide for viewing pond life. From strips of cardboard about 1/32" in thickness, U-shaped pieces are cut so that the outside edges are 9/10" long and the limbs and bottom of the U 2/10" wide. These are soaked in a wide-mouthed bottle of shellac until bubbles cease rising, then the excess shellac is drained off and each U laid on the center of a blank slide. The well is completed by covering with a 7/8" square cover glass and set aside to dry completely. A pipette is used to fill the well, which may be mounted under the spring clips of the microscope stage when the tube is vertical or tilted at any angle most comfortable for the observer.

Mr. Allan also sent us some interesting photographs of himself at work, including his library, work table, instruments and a photomicrograph of starch grains under polarized light—all of which were very much appreciated.

***

The scale covering the eye in a shed snakeskin can be mounted and used as a simple lens. It very much resembles a minute watch-crystal.

American Society of Amateur Microscopists

President, Simon Henry Gage, Ithaca, N. Y.
Permanent Secretary, Julian D. Corrington, Chestertown, Md.
Official organ, *Nature Magazine*, Washington, D. C.

Address all communications concerning the Society to Dr. Corrington at Chestertown, Md. Application for Membership form sent on request. Dues, one year, fifty cents; two years, one dollar. Nature and purpose of organization explained in October, 1938; installation announced in March, 1939, issue of *Nature Magazine*.

Deadline July First

The old questionnaire mentioned on numerous past occasions in these columns is no more. Its place has been taken, now that the Society is a going concern, by an Application for Membership card. As rapidly as time permits, data on questionnaires already received will be transferred to these new 5 x 8 buff cards, which are easy to file.

Before the next issue of the Magazine appears, certificates of membership will have been mailed to all who have sent in either a questionnaire or an application card, and who have paid their dues. These certificates will bear the statement that the holder is a Charter Member and will be issued up to and including midnight of June 30. Beginning July 1 and thereafter, certificates will designate the holder simply as a Member.

The first mailing to members is almost ready at the present writing and will have been received by them prior to this issue of the Magazine. It consists of a complete listing of members and their addresses, arranged geographically, and is being sent to all who have filled out questionnaires, whether or not they have paid dues. Thereafter, however, mailings will be made only to paid up members. Those planned for the immediate future include material on organizing and maintaining a microscope club, with suggested programs for meetings and collecting trips; the Constitution of the National Society; establishment of an Exchange for members whereby they may communicate ideas and trade slides, books, equipment or other items; and we are now beginning to receive contributions from members in the form of short articles—technique hints, homemade gadgets, interesting experiments and so on—which will be mimeographed and distributed as rapidly as possible.

The honor of becoming the first member of the A. S. A. M. goes to Marlow W. Hartung, Jr., 1003½ Tilgham St., Allentown, Pa., whose check for membership dues was the first received. He has also the distinction of having organized the first local Chapter of the Society, at present unnamed; details later.

One matter has developed over which there seems to be quite a difference of opinion and on which your suggestions are solicited—the number of Vice-Presidents we should have. Ideas range from a large number, each representing a separate field in microscopy, such as biology, chemical microscopy, photomicrography, industrial microscopy, metallography and so on, down to that held at present by the writer, of a small number, preferably one or two. A large number means much correspondence back and forth and a great deal of work in selecting suitable candidates each year. Your Secretary is extremely busy and has no stenographic assistance; hence such matters assume a practical importance. How many shall we have and what shall we call them? What is the function of a vice-president, anyway? Shall we have any at all? If you have any ideas or preferences, please drop the Secretary a postal card or letter and give him the benefit of your opinion.

And now here's something still more concrete to show how this Society is going to be of direct benefit to members: L. Wilson Greene, Box 222, Aberdeen, Maryland, a member of the Nominating Committee, offers to give all members small specimens of botanically identified natural fibers, suitable for mounting on slides, and including the following list: cotton (six kinds), kapok (Sumatra), coir yarn (Ceylon), henequin (Mexico), palmyra fiber (India), esparto grass (W. Africa), hemp (Hungary), hemp (Jugoslavia), sisal (Victoria), sisal (Kenya), jute (India), sunn fiber (India) and cocoa fiber (India). All members have to do is to write Mr. Greene direct and request those fibers you would like—all of them if you can use them—and inclose an addressed, stamped envelope. Mr. Greene is a chemical microscopist and has other offers of material to make later.

CRESTMONT INN

EAGLES MERE, PA.

Open Until September 25

Plan now for your holiday at this hospitable, beautiful Inn. Superbly situated—2200 ft. altitude, overlooking the lovely Lake of Eagles. All land and water sports; cycling and motoring over miles of scenic roads. Music, dancing, bridge. Attractive appointments . . . a **cuisine** that's famous . . . congenial fellow-guests attract a distinguished clientele. Cottages for families—children welcomed.

May we send you an illustrated folder D and rate card?

WM. WOODS, Proprietor
CRESTMONT INN Eagles Mere, Pa.

POCKET NATURE LIBRARY

Guides on Trees
Birds, Flowers
Butterflies
Set $5.98

The full set of four volumes contains 1,000 pages illustrated by 700 color plates and many black and white illustrations. Bound in flexible fabrikoid. Each $1.50.

NATURE BOOK DISTRIBUTORS
1212 16 St., N. W., Washington, D. C.

COME TO THE CHAMBERLIN

You'll enjoy 3 vacations in one here. There are sports activities, many places of historic interest, and the atmosphere of the Army and Navy at history's birthplace! You'll see beautiful gardens, and old St. John's Church. The Chamberlin's building and grounds are delightful—the sea view magnificent. Delicious food. Swimming indoors and out. Only a few hours away. Write for *special* weekly and week-end vacation rates.

See Nearby
WILLIAMSBURG
Yorktown • Jamestown
Fort Monroe • Mariner's Museum

The CHAMBERLIN

Sidney Banks, President
OLD POINT COMFORT
VIRGINIA

Among Our Authors

Andrew S. Wing (Wildlife in the Suburbs) grew up on an Ohio farm, wrangled in Wyoming, was graduated from Ohio College of Agriculture, had a fling at the family seed business, helped make the world safe for democracy with 18 months in the army and left military life to become associate editor of *Farm and Fireside*. After serving this publication for 13 years as managing editor, he aided in framing the editorial policy of the magazine when renamed *The Country Home*. Now devoting himself to writing, with gardening and trout fishing as hobbies.

Elaine M. Drew (Ebenezer II) is a native of Tennessee, former teacher and now wife of an osteopathic physician in Barre, Vermont. In the past three years she has banded 1200 birds in her own back yard, following a hobby interest in birds of some six years' standing. Actively interested in work with young bird-lovers.

John Lindsey Blackford (Vanishing Glory) lives in Libby, Montana, and has been a frequent contributor to NATURE MAGAZINE. His article this month varies from his usual delightfully-written essays on the outdoors and treats with an important conservation subject.

Adolph Kruhm (Bulb Progress) is well known as a garden writer for both newspapers and magazines. He is equally well known in horticultural circles both for his knowledge of the subject and his genial ways.

For Youngsters

In *A Family to Raise* Irmengarde Eberle provides the younger set with another entertaining and informative little Nature book. Treating with the home life of opossums, screech owls, white-footed mice, snapping turtles, wild ducks and coyotes, Miss Eberle makes the problems of existence of these wild friends dramatic and will leave with the younger reader much that is of value. In a foreword the author explains why she has let the animals talk in this book, pointing out that it was done to translate their unspoken language into our spoken language. While we have never regarded this device as appropriate to NATURE MAGAZINE we have no quarrel with it in books of this type, particularly when the dialog is as carefully kept within the experience of the actors as in this instance. The book is embellished with illustrations by Else Bostelmann, and is published by Holiday House at two dollars.

By Way of Explanation

Although we didn't realize it at the time, false inferences might be drawn from the picture and brief item about a dragonfly mistaking drying photographic plates laid out in the sun for water and depositing eggs thereon. This short article appeared on page 350 of our June-July issue. The picture shows a dragonfly posed over the glass plates, and the specimen so posed happens to be a male. It was impossible, of course, for the late Cornelia Clarke to get her equipment ready in time to take a picture of the female in the act of laying the eggs. She contented herself with watching this incident, and then, as a record, posed the handiest one of these insects.

Normal School Principal Finds N.I.A. Gives Real Service

"I have sold an article to Real America. Before enrolling I was skeptical of N.I.A. training as the best preparation for writing in fields other than newspaper reporting, but now I am convinced that you make good on your claim that N.I.A. is *the* preparation needed by writers in all fields. N.I.A. renders a real service by giving thorough, sincere and expert criticism."

E. L. MENDENHALL
253 Linden St., Fond du Lac, Wis.

Why can't you write?

It's much simpler than you think!

SO many people with a "germ" of writing in them simply can't get started. They suffer from inertia. Or they set up imaginary barriers to taking the first step.

Many are convinced the field is confined to persons gifted with a genius for writing.

Few realize that the great bulk of commercial writing is done by so-called "unknowns." Not only do these thousands of men and women produce most of the fiction published, but countless articles on business affairs, social matters, domestic science, etc., as well.

Such material is in constant demand. Every week thousands of checks for $25, $50 and $100 go out to writers whose latent ability was perhaps no greater than yours.

The Practical Method

Newspaper work demonstrates that the way to learn to write is by writing! Newspaper copy-desk editors waste no time on theories or ancient classics. The *story* is the thing. Every copy "cub" goes through the course of practical criticism—a training that turns out more successful authors than any other experience.

That is why Newspaper Institute of America bases its writing instruction on the Copy-Desk Method. It starts and keeps you writing in your own home, on your own time. And upon the very same kind of *actual assignments* given daily to metropolitan reporters. Thus you learn by *doing*, not by studying the individual styles of model authors.

Each week your work is analyzed constructively by practical newspaper men. Gradually they help to clarify your own *distinctive* style. Writing soon becomes easy, absorbing. Profitable, too, as you gain the "professional" touch that gets your material accepted by editors. Above all, you can see constant progress week by week as your faults are corrected and your writing ability grows.

Have You Natural Ability?

Our Writing Aptitude Test will reveal whether or not you have natural talent for writing. It will analyze your powers of observation, your imagination and dramatic instinct. You'll enjoy taking this test. There is no cost or obligation. Simply mail the coupon below today. Newspaper Institute of America, One Park Avenue, New York, N. Y.

Free

Newspaper Institute of America
One Park Avenue, New York

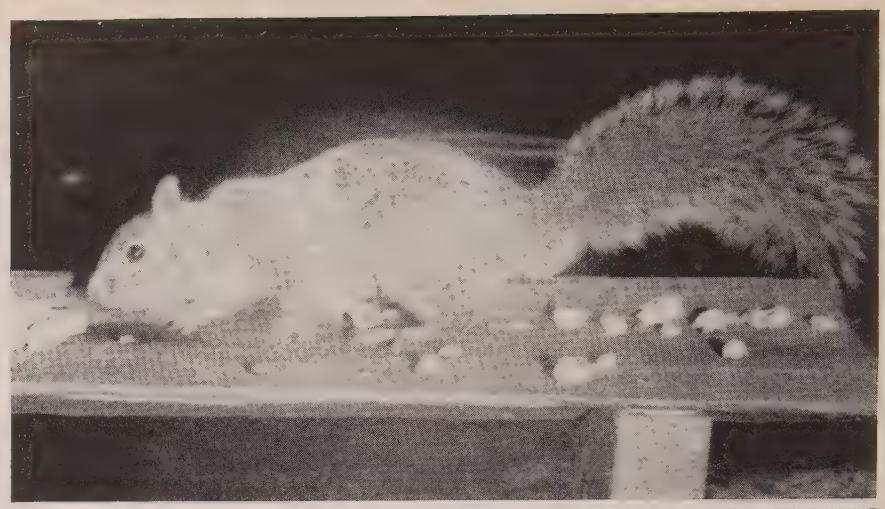
Send me, without cost or obligation, your Writing Aptitude Test and further information about writing for profit as promised in Nature, September.

Miss }
Mrs. } .....
Mr. }
Address .....

(All correspondence confidential. No salesman will call on you.) 871599

Camera Trails

BY NORRIS W. HARKNESS



A SQUIRREL TAKES ITS OWN PICTURE WITH AN ELECTRICAMERA, AN INEXPENSIVE INNOVATION FOR SUCH SPECIALIZED PICTURES

Making the Most of Our Light

How often we make pictures of small animals, a peculiar bark formation, or some other object whose coloring blends with that of its surroundings, only to find when the prints are made that we can scarcely distinguish our subject. We saw it plainly when we made the exposure, but when the camera translated the colors of the subject and the background into black and white, it lost most of the most important part of our picture. Our focusing was sharp and the exposure nearly enough correct, but we failed to catch our real picture.

Such failures may be due to either or both of two things. We should, perhaps, have used a filter—or some other filter than the one we chose—or we used too flat a lighting. The latter error is the most common in photographing objects whose color is like that of their background. A tree frog, for example, is practically the same color as the bark of the tree on which we find him, and a filter will not help us much when we try to separate him (photographically speaking), from the tree. In such cases we must try to get the light from the side rather than from behind the camera. The flat lighting casts too little shadow to make him stand out plainly. However, if we can drive him part way around the tree so that the light falls over his shoulder instead of over ours, we can expose a little longer to get the details in the shadow side, and the texture of his skin will be evident. At the same time, he will appear to stand out from the trunk.

The same side-lighting will make the unusual bark or stone formation more striking in our pictures. Such subjects, of course, we cannot turn to suit our convenience, but we can await the time of day that will find the sun in the right position, or we can use some form of artificial light to unbalance the existing daylight. A bit of magnesium ribbon burned as near the subject as can be managed without its showing in the negative will often do the trick. If the desired picture area is on the shady side of the tree, the light from the ribbon will be sufficient, but if the subject is in the direct sunlight, we should hold something to cast a shadow over the wanted section while the light of the magnesium acts from the side. This is simply applying the principles of portraiture to other subjects, and, indeed, we are really making portraits of the interesting subjects we find. Usually the exposure will not be materially altered by the magnesium, and we can use the same aperture and shutter speed that we would without it. A little experimenting with the combined daylight and magnesium flare will show the needed changes in exposure (if any), and the best angle at which to hold the ribbon.

When the subject's color differs from that of its surroundings, we can gain the desired emphasis in the picture by using filters. We must remember that each filter transmits best its own color, and least its complementary color. This means that an object whose color matches that of the filter will appear light in the print, and the complementary color will be dark. With panchromatic film, for example, and a yellow filter, yellow objects photograph light and violet ones dark. With a red filter, blue objects are very dark and red ones much lighter than they seem to the eye. Orthochromatic film, on the other hand, is nearly blind to red, and we should not use the red filter with such films as Plenachrome and Verichrome. These films photograph red objects very dark while recording the other colors in nearly their correct values. Yellow filters with them have the same effect as with the panchromatics. The following table may be used as a guide in choosing the filter for any particular problem.

Filter color	These colors will photograph lighter than they are to the eye.	These colors will be darker.
Yellow	Yellow and brown	Blue
Greenish-yellow	Green and yellow	Blue and red
Blue	Blue	Red (very dark)
Red	Red	Blue (very dark)
Green	Green	Brown and red
Orange	Red and yellow	Blue and green

Naturally, we must determine the factor of the color of the filter we choose with the film we are using, and increase the exposure enough to make up for the presence of the filter.

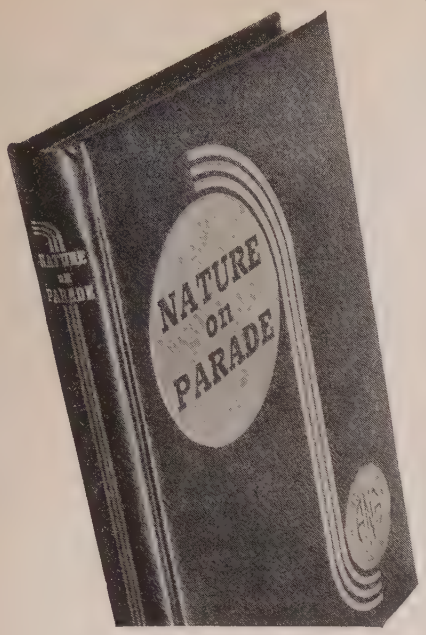
The next time you wish to photograph a colored object, make a few test exposures with the different filters you may happen to have. Keep a record of all the important data and compare the resulting prints with that record. A few such tests will enable you to make successful and satisfying prints of these difficult subjects every time.

This and That

Cutting mats for the best mounting of our prints is made easier by a new cutter announced by the Raygram Corporation of 425 Fourth Avenue, New York. The cutter, called the X-Acto Automatic, may be used to make either vertical or 55 degree cuts for the attractive beveled effect, and is also arranged to do trimming and scoring. It is all-metal and substantially built, and is available in three sizes that retail from $7.50 to $15.00. A circular describing the X-Acto cutter will be sent to all readers who mention this department in writing to the distributors.

The picture at the head of Camera Trails was made with the new Abbey Electricamera. The squirrel fired the shot himself by pulling on a nut that was attached to the trigger of a mouse-trap that was arranged to serve as the switch which touched off both the flash bulb and the synchronized shutter. More will be seen of this equipment later in these columns. The camera was ten feet from the bait. The Electricamera is an ordinary box camera equipped with an electric shutter that requires the use of the battery case, whether a flash bulb is synchronized with it or not. The camera and synchronizer are priced at less than ten dollars, making an outfit that we can leave out at night under conditions that would make us prefer to miss the chance of the picture rather than risk our more expensive equipment. For a pamphlet describing the Electricamera, send a three cent stamp to this department.

We have all had trouble with negatives and motion picture films that scratched easily and dried out to become brittle and curled, but prevention of this deterioration of the emulsion has hitherto required rather expensive equipment and has needed considerable processing time. Now a new preparation, Cinelac, offers a quick and simple way to protect either still or movie films at home. The liquid is swabbed over the emulsion and dries in a minute or two—and that's all there is to it. For full information on Cinelac—which is *not* a lacquer—or their factory processing of



NATURE on PARADE

$5.00

An album of more than one thousand of the finest Nature Photographs ever taken

A beautiful book, size 9 x 12, 388 pages, bound in dark green imitation leather, Spanish grain, soft padded cover, stamped in gold leaf.

Since NATURE MAGAZINE made its bow in January, 1923, thousands of Nature pictures have been reproduced on its pages. These constitute the most remarkable pictorial parade of Nature ever published. The editors of Nature Magazine have reached out to gather together the best in Nature pictorial features, presenting them through the graphic process of rotogravure. More than one thousand outstanding Nature pictures are presented, with descriptive story relating to them. They unfold the camera's record of the life history of birds, mammals, or insects; or they represent typical flowers, trees, and other Nature forms of a certain region. A book of surpassing beauty and constant interest.

The edition is limited to one thousand numbered copies

Mail your order today

American Nature Association
1214 Sixteenth St., N. W., Washington, D. C.

Enclosed find $..... for ..... numbered copies of NATURE ON PARADE.

Name .....

St. & No. .....

City & State .....

movie films, write to Department N, Cinelac, 610 Fifth Avenue, New York City.

The S. Mendelsohn Company of 202 East 44th Street, New York, makers of the well-known Mendelsohn Speedguns, have several synchronizers and attachments that will interest all Nature photographers. The new remote control accessory for their synchronizers is especially worth investigating. Please mention Camera Trails when you write for your copy of their *Speedgun Photography.*

Users of photoflood bulbs will want the descriptive matter on the "Hi-Lo" switch recently introduced by the Lafayette Camera Corp., of 100 Sixth Avenue, New York City. The switch, which sells for $3.89, handles up to four of the popular bulbs, and permits them to be burned at low power while focusing and getting ready for the exposure, which is made with their full strength. A descriptive circular will be sent on request to any reader of this department.

Willoughby's Inc., at 110 West 32nd Street, New York City, have opened a new color department with experts available to help us with our color problems. The department has a complete line of color materials and stands ready to serve photographers with either the materials or equipment needed or advice on their use. The same organization has also introduced, at $9.75, a new enlarging easel for prints up to 11″ x 14″ with adjustable metal masking devices and a light-tight box to hold paper, and the A. G. Print Press for finished prints which sells for $10.00. The press has guide posts that may be set to take care of several sizes of prints to make the pressing easier, and handles any size up to 11″ x 14″. Full information on any of the above will be sent to readers of this department on request.

For the photographer who is interested in copying or in making pictures of small objects that can be placed on a stand at home, we recommend highly the Solar Copy Stand which is priced at only $24.50. The stand holds any camera at distances up to 36″ from the baseboard, and has a horizontal adjustment that permits moving the camera back and forth to center the work properly. Friction locks and a counter-balance allow one-hand operation in either direction. Write this department for information on this useful machine and enclose a three cent stamp.

Camera Trails is granted space in Nature Magazine for those readers who are interested in photography, and, as a department of the magazine, maintains a service to render whatever assistance is possible with your photographic problems. You are invited to take advantage of this service, and also to help in the improvement of the department by your criticisms and suggestions as to what should appear in it. Address your letters to Norris W. Harkness, Camera Trails, Nature Magazine, 1214 Sixteenth Street, N. W., Washington, D. C.

WATSON . . . —the CAMERA for action shots

For split second action. Small, compact and literally loaded with every desireable feature for the amateur. Uses 35mm. film, 36 exposures per load. Finest lenses and shutters. Exposure counter. Optical eye level finder adjustable for parallax. New vibrationless trigger squeeze shutter release. Economically priced. Send for free catalog No. 639, today.

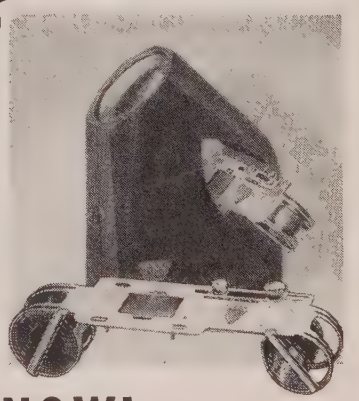
BURKE & JAMES, Inc.
223 W. MADISON ST. CHICAGO, ILL.

MIRAKEL DAYLUX BINOCULAR

POCKET PRISM NATURE GLASSES

New and Used Field-glasses, Telescopes, Microscopes; all Makes, types and sizes, to fit all pocketbooks. Glasses exchanged: repair work guaranteed. Catalogue free.

J. Alden Loring Box K-2 **Owego, N.Y.**



NOW! STRIP FILM ATTACHMENT.....

FOR BAUSCH & LOMB FILM SLIDE VIEWER The Filmorator, new Film Slide Viewer attachment for viewing of 35 mm strip film, makes easy the critical examination of mini negatives before enlargement. Operating button advances film frame by frame. Cannot scratch negative. Instantly attached or removed from Slide Viewer. Filmorator, $3.00. Film Slide Viewer, $8.50. *Write for descriptive folder.*

BAUSCH & LOMB
359 BAUSCH ST. ROCHESTER, N. Y.

NATURE MAGAZINE

PUBLISHED BY THE AMERICAN NATURE ASSOCIATION

To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

IN THIS ISSUE

Cover Design ..... Rosalie Rees
Camera Trails ..... Norris W. Harkness 362
Indoors and Out ..... Howard Zahniser 367
Wild Life in the Suburbs .... Andrew S. Wing 369
Water (Poem) ..... Eleanor Allen 372
Ebenezer II ..... Elaine Martin Drew 373
Bulb Progress ..... Adolph Kruhm 376
Spying on Thalessa .... Mary Carpenter Kelley 379
Sand Crystals ..... C. S. Gwynne 380
The Modest Club-Mosses ..... S. Judson Ewer 381
Shroud (Poem) ..... Oscar Ostlund 384
The Kingdom of the Tides .... Henricks Hodge 385
Bear Grass Blooms ..... Milo R. Clare 389
Camp Neighbors .. Lloyd and Elizabeth Ingles 391
Conservation Editorials 393
Things to Think About 395
Vanishing Glory? ..... John Lindsey Blackford 397
Blue Geese Nesting in Manitoba
Myrtle J. Broley 402
Ebbie—A Personable Crow
Grace Ernestine Ray 403
"Two Temples" (Poem) ..... Greta Gratz 403
August-September Skies ..... Isabel M. Lewis 404
The School Page ..... E. Laurence Palmer 406
A Dog's Diet ..... Diana Thorne 411
Under the Microscope .... Julian D. Corrington 414

NATURE MAGAZINE, PAST AND PRESENT, IS INDEXED IN THE READER'S GUIDE IN YOUR PUBLIC LIBRARY

U. S. AND CANADA
ONE YEAR $3
FOREIGN .. $.75 EXTRA
TWO YEARS $5
LIFE $100

A. B. McClanahan, Advertising Manager

ADVERTISING OFFICES

New York—295 Madison Avenue
Washington—1214 16th St.
Chicago—203 N. Wabash Avenue
Philadelphia—934 Real Estate Trust Bldg.
Atlanta—Walton Building
Los Angeles—Western Pacific Building
San Francisco—Mills Building
Minneapolis—233 Radisson Hotel
St. Louis—Chemical Building

NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D. C. Additional entry at Greenwich, Conn. $3.00 a year; foreign $3.75.

Publication and Editorial Office, 1214 16th Street, N. W., Washington, D. C. Additional Office of Publication, Greenwich, Conn.

Copyright, 1939, by American Nature Association

Title Registered U. S. Patent Office

THE ASSOCIATION

ARTHUR NEWTON PACK ..... President
Abiquiu, N. M.

RANDOLPH G. PACK ..... Vice-President
Darien, Conn.

RICHARD W. WESTWOOD ..... Secretary
Washington, D. C.

JAMES A. O'HEARN ..... Treasurer
New York, N. Y.

HARRY E. RADCLIFFE ..... Business Manager
Washington, D. C.

DR. E. LAURENCE PALMER .... Director, Nature Education
Cornell University, New York

THE MAGAZINE

ARTHUR NEWTON PACK ..... Editor

RICHARD W. WESTWOOD ..... Managing Editor

EDWARD A. PREBLE ..... Associate Editor

R. BRUCE HORSFALL ..... Artist

HARRY E. RADCLIFFE ..... Business Manager

SCIENTIFIC CONSULTING BOARD

DR. LELAND O. HOWARD
Retired Chief, U. S. Bureau of Entomology

DR. WALDO L. SCHMITT
Curator of Marine Invertebrates, U. S. National Museum

DR. HARRY C. OBERHOLSER
Senior Biologist, U. S. Biological Survey

W. L. McATEE
Technical Adviser, U. S. Biological Survey

C. W. GILMORE
Curator of Vertebrate Paleontology, U. S. National Museum

VERNON BAILEY
Retired Chief Naturalist, U. S. Biological Survey

DR. PAUL BARTSCH
Curator of Mollusks, U. S. National Museum

DR. EDGAR T. WHERRY
Wild Flower Preservation Society

DR. WILLIAM M. MANN
Director, National Zoological Park

THE ASSOCIATION'S BOOK SHELF

Valuable reference Books of the AMERICAN NATURE ASSOCIATION, published as a service to members in stimulating interest in Nature and the outdoors and the practical conservation of our natural resources. Order direct from the Association.

BIRD AND ANIMAL PAINTINGS $1.50

By R. Bruce Horsfall

Beautifully printed, size 8½ x 11 inches, contains 168 pictures of birds, animals, and insects, in full colors, size 2½ x 3½ inches, and an attractive frontispiece of the American Eagle. Each picture accompanied by concise description of the character and habits of the subject. Good for school, camp or home.

NATURE ON PARADE $5.00

An album of more than a thousand of the finest Nature photographs ever taken, with descriptive story relating to them. They unfold the camera's record of the life history of birds, mammals, or insects; or they represent typical flowers, trees, and other Nature forms of a certain region. A book of surpassing beauty and constant interest. It is a limited and numbered edition of one thousand volumes. Book size 9 x 12, 388 pages bound in Dupont Fabricoid, Spanish grain, soft padded cover, stamped in gold leaf.

PIONEERING WITH WILDFLOWERS $2.00

By George D. Aiken

This book is helpful in growing wildflowers. Tells how to gather the seed. Also explains soil and climatic conditions. Attractively written, fully and beautifully illustrated.

CHALLENGE OF LEISURE $2.00

By Arthur Newton Pack

It is the most profoundly observing and keenly thought-out book on the subject of the significance and possibilities of the promised leisure that has yet appeared.

BIRDS OF THE STATES ..... 25¢

(10 or more 10¢ each)

How, When and Why they were chosen as official emblems. A 16 page booklet, size 8½ x 11 inches presenting 30 full color paintings 2½ x 3½ inches of all the state birds thus far selected. There is included detailed, correlative text describing the character and habits of each bird. Also a complete list of the State Flowers. An illustrated article on the birds and the method of their selection, stating legislation under which each was adopted.

BOUND VOLUMES OF NATURE MAGAZINE

Volumes 2 to 30, containing six issues $3.00 each
Volume 31 " ten " $5.00 each

Here is an encyclopedia of nature information utterly unlike any other you could obtain, a compilation of the material that has appeared month after month in NATURE MAGAZINE. A wealth of fascinating stories about BIRDS, MAMMALS, FISHES, PLANTS, INSECTS, TREES, SKIES and other phases of Nature and the outdoors. Scientifically accurate and unique in its scope and completeness. Every school, every library, every home will be enriched by possessing these valuable and attractive volumes. Volumes 2 to 30 include six issues of NATURE MAGAZINE. Commencing with Volume 31, ten issues are bound into attractive books. Volumes 1 to 19 are bound in dark green cloth with gold letters. All subsequent volumes are bound in dark brown imitation leather and stamped in gold. Volumes 1, 4, 5, 6 and 7 have been completely sold.

A NEW DEVELOPMENT IN NATURAL SCIENCE PEDAGOGY. Available upon receipt of 6¢ to cover postage.

A booklet of suggestions giving an actual outline of study, with grade recommendations, will prove helpful in aiding the teacher in her praiseworthy interest in bringing to the youth of the land a comprehensive knowledge and an enthusiasm for the science of Nature.

NATURE MAGAZINE'S GUIDE TO SCIENCE TEACHING ..... 25¢

By Prof. E. Laurence Palmer

Written to guide those who teach science in the first ten years of school. Prepared on a philosophy that science is not only a series of organized facts but more important than this it is concerned with the method by which facts are established. The suggestions are directed towards a solution of pertinent problems and involve activities suitable to the abilities of the children to learn not solely from books but from real sources which are immediately available for study.

FOREST FACTS FOR SCHOOLS ..... 80¢

By Charles Lathrop Pack and Tom Gill

A charmingly written, beautifully illustrated book for pupils in Grades 5 to 12. Exercises and new type texts follow each division of the text matter. Arranged for National use. Covers the subjects of forestry movements, forestry problems in the United States, uses of trees and the by-products of the forests, and the steps necessary to insure perpetual benefits from our forests. 336 pages, 34 illustrations, cloth bound.

FORESTS AND MANKIND $3.00

By Charles Lathrop Pack and Tom Gill

This story of the forests has to do with the timberlands of yesterday, today and tomorrow; with the ever-changing aspects of the earth; the ceaseless but varying relationship between man and trees, and with life itself. Convincing knowledge of the importance of the forests in their historical, social and economic relation to mankind. 250 pages, 66 cuts and illustrations, cloth bound.

TREES AS GOOD CITIZENS $2.00

By Charles Lathrop Pack

In simple, intensely interesting words, with many clear pictures, this book tells the whole story of the shade tree. How to identify varieties; which to plant in different localities to meet conditions of soil, climate, and situation; how to keep trees healthy and free from injurious insects. Cloth bound, 268 pages, 16 full color plates, 125 other illustrations.

AMERICAN NATURE ASSOCIATION

1214 16th St., N. W.
Washington, D. C.

Enclosed find (check or P. O. Money Order) for $..... for which mail me postpaid the following books of the Association.

.....

.....

Name.....

St. & No.....

City & State.....

IT'S GOOD
Year after year your telephone service gets better and better. It becomes clearer, quicker, more dependable.
IT'S CHEAP
Nowhere else in the world do people get so much service and such good and friendly service at such low cost.

BELL TELEPHONE SYSTEM

• The Bell System cordially invites you to visit its exhibits at the New York World's Fair and the Golden Gate International Exposition, San Francisco.

Mention NATURE MAGAZINE *when answering advertisements*

Indoors and Out

By HOWARD ZAHNISER

It is better to be in the mountains in August than anywhere else that I know. Very early in the morning—say, around five o'clock—it is possible for a few minutes, maybe an hour, to breathe a summer air that has a mountain flavor even in the lowlands, and incidentally at that early hour it is possible also to know something of the solitude that attends mountains. Pure air, a feeling of freshness, and a relief from pressure of crowds—these are some of the "early-morning" virtues that last throughout the day in mountains. They can be taken for granted almost as confidently as one can expect fine views from the mountains and exhilarating exhaustion from the climbing.

I remember one August evening when my wife and I stopped "over night" at the base of the mountains of Grand Teton National Park in Wyoming—and stayed a week. We stayed so long, in fact, that our once-intended trip to the Pacific Coast reached its westernmost point in Yellowstone National Park. These two national parks together slowed us up so that it would have been hopeless to have tried to see the Pacific during that vacation, and most of the creditable blame for this has always gone to those mountains around the Grand Teton. All of us would probably be better off if we could more frequently be slowed down (or up) by climbing above the horizontal planes of our normal hustle and bustle.

Fortunately we do have the mountains and surroundings for such ascents safeguarded for us in many national parks, and I am sure there are few things that outdoor folks are more thankful for than these parks. September 19 should in one sense be an annual day of thanksgiving and commemoration of that 1870 campfire decision at the confluence of the Firehole and Gibbon Rivers in what is now Yellowstone National Park. The account of this campfire by the party that explored the Yellowstone region is one "romantic" highlight of Harlean James's *Romance of the National Parks* (The Macmillan Company, $3)—an inspiringly illustrated volume that summarizes the history of the national park movement and describes the parks. In the midst of a discussion at that 1870 campfire of how the Yellowstone might best be commercialized, Cornelius Hedges said "that there ought to be no private ownership of any portion of that region, but that the whole of it ought to be set apart as a great National Park." It was an inspired suggestion, but no less remarkable than the fact that every member of the party but one immediately agreed with enthusiasm, abandoning any visions of personal gain. It must be a constant reassurance for those who are still working for the public benefits of unspoiled outdoor areas to recall this almost unanimous approval. The thanksgivings of September 19 should be as much in remembrance of the party that welcomed the suggestion as of Cornelius Hedges, who made it.

Miss James's book, of course, makes it plain that the later history of the park idea has been one of constant struggle against special interests, and that we beneficiaries have thanks to distribute in many quarters. It seems certain, also, that we shall have many opportunities to help maintain the park idea for those who come after us. Such discussions as her chapter on "Prospect: Philosophy of Parks and People", pointing out the efficacy of natural areas for civilized people who have "lost contact with the manifestations of Nature and the laws of the Universe," will certainly help keep us inspired and informed to advance this "good cause."

Resort to the mountains derives much of its tonic value to us because of the fact that we have such highly mechanized ways of living in the lowlands, but it is perhaps well to remind ourselves that the mountains were the refuge of men before the age of machines and that the offers of the mountains are positive as well as negative. R. L. G. Irving's *The Mountain Way: An Anthology in Prose and Verse* (E. P. Dutton & Co., Inc., $3) certainly makes this plain. Conrad Gesner, author of the book's first selection, said, in 1541, "I have made up my mind . . . that henceforth, as long as it shall please God to let me live, I shall every year climb a few mountains," and as for those who would not go to the mountains he declared, "let them crawl upon the earth that fascinates them with the mean pursuit of gain."

Mr. Irving's book was first a European publication, and, with the exception of two excerpts from the writings of John Muir, I found nothing that pertained peculiarly to the mountains of this hemisphere. Yet it seems apparent on reading these extracts from writings on mountains and mountain climbing in Europe and Asia that when one climbs he also gets above the differences between continents. I believe that Vincent O'Connor could in the Tetons—as well as in the Alps—have had the experiences that inspired him to write:

> I feel life pricking underneath the skin,
> and the skin tingle, and the quivering flesh
> pulsate with a new life; the muscles laugh
> firm, clean, and proud.

Mr. Irving says if you can't go to the mountains, or visit with a friend who has been to the mountains with you, there is still a way, "a third best only", to bring back the mountains: "You may let those who have been under the enchantment of mountaineering try to describe to you the nature of their spell." "This," he says, "is a bedside book, designed to lead you into the pleasant land of memory or dreams," and in my opinion it fits American bedsides as well as it must those in England.

It is rather an interesting coincident that it was while I was reading these books on mountains that take us away from the complexities of our civilization that I received Dr. Caryl P. Haskins's fascinating and provocative book *Of Ants and Men* (Prentice Hall, Inc., $2.75). This discussion of the extremely social arrangements of the tiny creatures that we seem to be (Continued on page 410)

IN WINTER THE PHEASANTS COME MORNING AND EVENING TO EAT THE SCRATCH FEED SCATTERED FOR THEM